DOCUMENT RESUME

ED 449 605 EC 308 211

AUTHOR	Wilcox, M. Jeanne; Norman-Murch, Trudi; Oberstein, Jill S.; Volkmann, Melody A.; Wagner, Deanna K.; Musselwhite, Caroline Ramsey; Malena, Edye
TITLE	Assistive Technology and Early Childhood Education.
INSTITUTION	Arizona State Univ., Tempe.
SPONS AGENCY	Special Education Programs (ED/OSERS), Washington, DC.
PUB DATE	1999-00-00
NOTE	211p.; For related documents on assistive technology training, see EC 308 210 and EC 308 212. Illustrations by Caroline Ramsey Musselwhite and Martha C. Lewis.
CONTRACT	H029K40092
AVAILABLE FROM	Dissemination Coordinator, Infant Child Communication Research Programs, Arizona State University, P.O. Box 871908, Tempe, AZ 85287-1908.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	MF01/PC09 Plus Postage.
DESCRIPTORS	Accessibility (for Disabled); *Assistive Devices (for Disabled); *Augmentative and Alternative Communication; Classroom Techniques; *Computers; *Curriculum Design; *Disabilities; Educational Environment; Educational Technology; Evaluation Criteria; Federal Legislation; Financial Support; *Individualized Education Programs; Play; Preschool Education; Program Implementation; Selection; Teamwork

ABSTRACT

Designed for early childhood educators working with children who have a wide variety of disabilities, this manual discusses the ways in which assistive technology can facilitate the child's active participation in developmentally appropriate activities and offers ideas for incorporating devices and strategies into daily school and home routines. Chapters 1-5 provide an opportunity to explore and review the foundations of assistive technology including relevance to real life tasks, legislative mandates which have created the framework for accessible technology, services to people with disabilities, and the importance of a team-based technology selection and service delivery process. Specific assistive technologies for positioning, access, communication, play, and computer use that are available to enhance a child's independence and skill development are introduced. Chapters 6, 7, and 8 focus on implementation issues: curricular issues that foster and support a "big picture" approach to assistive technology use in educational settings; the relationship between the Individualized Education Program process, technology implementation, and functional outcomes; and funding options. The final section offers guidelines and suggestions for training personnel to become effective assistive technology trainers. Appendices include instructions for creating many of the low cost and simple technology items mentioned throughout the manual. (Contains 67 references.) (CR)

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ASSISTIVE TECHNOLOGY AND EARLY CHILDHOOD EDUCATION

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EC 308211

Development of this manual was supported by a U.S. Department of Education Grant #H029K40092 for which M. Jeanne Wilcox was the Principal Investigator. The information contained in this manual does not necessarily reflect the views of the U.S. Department of Education and no official endorsement should be inferred. Correspondence concerning this manual should be addressed to: Dissemination Coordinator, Infant Child Communication Research Programs, Arizona State University, P.O. Box 871908, Tempe, AZ 85287-1908.

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Acknowledgements

Illustrations courtesy of:
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Sincere thanks to Martha Lewis, Mary Uhlir, Dick Bissegger and Kathy Smith for their assistance in preparing this manual. Our gratitude is also extended to the preschool teams from the following Arizona school districts who participated in the Preschool Assistive Technology Training Project, and field-tested earlier versions of this manual:

- Amphitheater Unified School District
- Cartwright Elementary School District,
- Casa Grande Elementary School District
- Cave Creek Unified School District,
- Deer Valley Unified School District
- Gilbert Unified School District,
- Isaac School District,
- Paradise Valley Unified School District,
- Tucson Unified School District,
- Washington Elementary School District,

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Forward

Early Assistive Technology: Personnel Needs and Practices

The critical role played by assistive devices and technology in enabling individuals with disabilities to participate in age appropriate activities within home, school, and community settings has been recognized through several changes in federal policy. First, the reauthorization of P.L. 94-142, the Education Amendments of 1986 (P.L. 99-457), established a discretionary program of technology, educational media, and materials for individuals with disabilities. Second, the Technology-Related Assistance for Individuals with Disabilities Act of 1989 (P.L. 100-407) established an important federal initiative for states to undertake activities related to providing individuals with disabilities (irrespective of age) access to technological services and devices. Third, in the 1990 Amendments to the Individual's with Disabilities Education Act, congress incorporated definitions of assistive technology devices and services into the Act including Parts B (preschool programs) and H (infant/toddler programs). It is important to note, that prior to these Amendments, assistive technology devices and services were generally believed to be beyond the scope of Part H or Part B responsibilities. Thus, IDEA now clearly reflects the importance of providing assistive technology devices and services during early childhood intervention efforts.

The IDEA defines an assistive technology device quite broadly as anything (i.e., item, equipment, or product system) that is used to establish or enhance functional capabilities of individuals with disabilities. Assistive technology services are defined with equal breadth and include "...any service that directly assists an individual with a disability in the selection, acquisition, or use of an assistive technology device" [20 U.S.C. 1401 (a)(26)]. In September, 1992, OSERS issued final regulations regarding the implementation of these statutory provisions for Part B and clearly specified that assistive technology devices and services must be made available to any young children with disabilities who require assistive technology devices and services in order to receive a free appropriate public education (FAPE). In policy letters released since the passage of the 1990 Amendments, OSEP has made explicit the breadth with which the new requirements are to be interpreted. First, public agencies, including school districts, must provide assistive technology devices and services whenever determined necessary for a child to receive a FAPE. Thus, programs must provide assistive technology devices and services as necessary on a child's IEP. Second, such devices and services may be provided as a part of special education, related services, or aids and services to children in regular classrooms. Prior to this policy clarification, many regarded assistive technology devices and services as related services that could only be provided to children in special education classrooms. It is now clear that these services must be provided to any eligible child who requires them in order to maximally benefit from placement in a regular or special education program and that such may be designated as either a special education or a related service. Finally, assistive technology devices are to be made available within children's homes as necessary to provide a child with a FAPE.

Over a decade of research and descriptions of best practices have documented the numerous benefits of assistive technology devices and services for individuals with disabilities (e.g., Behrmann & Lahm, 1984; Beukelman & Miranda, 1992; Brinker & Lewis, 1982a, 1982b; Esposito & Campbell, 1986; Garner & Campbell, 1987; Hanline, Hanson, Veltman, & Spaeth , 1985; Gergen & Hagen, 1985; Hutinger & Keefe, 1985; Miranda, Iacono, & Williams, 1990; Panyan, Hummel, & Jackson, 1988; Pressman, 1987; Scadden, 1989; Schaeffler, 1988; Schiefelbusch, 1982; Torner, 1986; York, Nietupski, & Hamre-Nietupski, 1985; York & Rainforth, 1987). Further, as a part of the ongoing effort to identify best practices for young children with disabilities, increasing attention has been placed on the importance of the selection and use of assistive technology for this young population in particular (e.g., Burkhart, 1987; Hanline et al., 1985; Goossens', Sapp-Crain, & Elder, 1992; Horn & Warren, 1987; Horn, Warren, & Reith, 1992; Musselwhite, 1986). As with early childhood intervention in general, inherent within the application of early assistive technology is the belief that appropriate early assistive efforts can substantially facilitate a child's ability to fully participate in typical home, school, and community activities. It is well documented that individuals with severe or multiple disabilities frequently have difficulty learning and performing activities that enable full independence as adults. Early identification and assistive technology efforts have the capability of modulating these effects through preventing diagnosed impairments (e.g., vision, hearing, movement, speech) from becoming major disabilities (Beukelman & Miranda, 1992; Goossens', Sapp-Crain, & Elder, 1992; Wilcox, 1989).

Early Assistive Technology Models and Practices

Early assistive technology devices and services, including adaptation of play materials, beginning augmentative communication devices, and microcomputers have been successfully used to enhance and facilitate participation and skill acquisition of young children with disabilities in several areas that are regarded as important for a "regular" school placement. For example, cognitive skills such as cause and effect, visual tracking, means-end relationships, object permanence, and problem solving abilities have all proven amenable to teaching through use of assistive technology in typical preschool activities (e.g., Burkhart, 1982; Goossens' and Crain, 1985; Musselwhite, 1986). As a further example, the benefits of augmentative communication devices are widely recognized with respect to facilitation of language, communication, and social development. Historically, intervention personnel have adopted a "wait-and-see" attitude toward the use of augmentative devices or other communication-based assistive technology. However, it is increasingly apparent that through the appropriate selection and use of beginning augmentative devices, many young children with disabilities are able to make important progress in communication, language, and social development that is required for inclusion in typical home, school, and community activities (e.g., Beukelman & Miranda, 1992).

Another area in which assistive technology is emerging as beneficial to young children with disabilities pertains to early literacy skills. Typically, literacy has not been a primary focus with this population because of the prevailing view that unless children are "ready" to read, it is fruitless to teach them (Koppenhaver, Coleman, Kalman, & Yoder, 1991).

Further, spoken language skills have been viewed as prerequisite to written language abilities. As a result, literacy has infrequently been a concern or programming goal for young children with disabilities. Current emergent literacy research disputes the notion that young children with physical, cognitive, or communication disabilities cannot benefit from experiences with written language (e.g., Katims, 1991; van Kleeck, 1990). When such research is considered in conjunction with the critical importance of literacy throughout one's life, it is clear that programming efforts for young children with disabilities must include a focus on facilitation of emergent literacy skills. Assistive technology devices and services can play a significant role in achieving literacy-based programming goals. For example, children with disabilities may often lack active access to materials important to the emergence of literacy skills such as books, printed materials, writing tools or interactive story-telling routines (Koppenhaver, Evans, & Yoder, 1991; Koppenhaver, et al., 1991; Light, Kelford-Smith, & McNaughton, 1990; Lorenz, Sloper, & Cunningham, 1985). An interactive computer literacy center can easily remediate this access difficulty by providing children with disabilities with the same access to reading materials as their typical peers. As a further example, Koppenhaver & Yoder (1991) reported that during reading activities, children with severe speech impairments were found to often lack access to their augmentative communication devices and therefore were relegated to a more passive role. With assistance from personnel knowledgeable regarding beginning augmentative communication devices and curriculum, a reading activity can easily be modified to provide opportunities for the AAC user to fully participate.

Collaborative Provision of Services

In many respects, assistive technology devices and services have traditionally been regarded as primarily within the scope of practice of related services personnel including speech-language pathologists, physical therapists, and occupational therapists. Members of each of these disciplines have expertise to contribute regarding the appropriate selection of various high and light tech devices. However, technological devices are not an end in and of themselves. Rather, they must be viewed as means for facilitating greater independence and participation in typical activities. Related services personnel may inadvertently contribute to the notion of technology as an end because they often lack expertise required to ensure full use and integration of various technological devices and services within the broader early childhood curriculum. In contrast, early childhood special education teachers and aides possess expertise with regard to the curriculum and development of functional goals, but may lack the necessary knowledge and skills regarding (a) assistive technology devices, and (b) integration of these devices across the curriculum in a functional, developmentally appropriate manner. Finally, policy interpretations make clear the fact that children with disabilities who are included in typical preschool or child care programs are also eligible for assistive technology devices and services as determined necessary. Thus, early childhood education teachers and child development specialists must also be considered in the collaborative equation. Although early childhood education teachers/child development specialists are knowledgeable about developmentally appropriate practices and comfortable within a play-based curriculum, they may not be trained in instructional strategies for implementing individualized educational plans, and they are unlikely to have substantial experience and/or knowledge regarding assistive technology devices and services. In order to ensure that young children with disabilities truly benefit from assistive technology efforts, a greater blending of professional roles (Bailey, 1989) and team-based collaborations in delivery of services will be required. However, differences in philosophy, training, and experiences of early childhood education (ECE), early childhood special education (ECSE), and related services (RS) personnel may create substantial barriers to this blending process (e.g., Burton, Haines, Hanline, et al., 1992). Although the concept of collaborative service delivery is not new for ECSE, RS, or ECE personnel, the practice of such will require an active commitment to unification around the needs of young children with disabilities.

As efforts to achieve true partnerships among ECE, RS, and ECSE personnel around the needs of young children are undertaken, it will also be necessary to develop new methods for provision of education and therapeutic services. It is not possible for all personnel involved in early childhood interventions to have all of the required knowledge and expertise for the design, selection, and use of early assistive technology. Further, ECE, RS, and ECSE approaches by themselves are not sufficient to achieve desired outcomes. The varying service delivery perspectives of each category of personnel will need to achieve some degree of convergence in order for young children to fully benefit from programming efforts (Mallory, 1992) both for early childhood interventions in general, and infusion of early assistive technology in particular. For example, most ECE personnel operate from the principles of Developmentally Appropriate Practice, which are at least in theory, applicable for all young children, but in reality require certain modifications in order to achieve maximum benefits for children with disabilities (e.g., Carta, Schwartz, Atwater, & McConnell, 1991). Practice modifications will also be necessary for related services personnel. For example, speech-language pathologists and other related services personnel are typically trained to provide specific "pull-out" therapies that often include use of assistive devices. However, they may lack basic knowledge and skills for achieving the same therapeutic objectives within a developmentally appropriate preschool curriculum. Finally, ECSE personnel, who have typically been trained in the more traditional special education model, will need to devise methods for achieving desired child outcomes in a less didactic mode. There is an emerging consensus and research base indicating that isolated didactic models of service provision do not result in maximum benefits for young children with disabilities (e.g., Bricker & Veltman, 1990; Peterson, 1987; Safford, 1989; Warren & Kaiser, 1988; Wilcox, Kouri, Caswell, 1991). Thus, "best" practices models for provision of special education and related services in early childhood reflect the database and view that children derive maximum benefit from such services.

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Preface

This manual has been designed as a practical text for persons working in early childhood educational settings with children who have a wide variety of disabilities. Its two-fold purpose is to provide the reader with an understanding of the ways in which assistive technology can facilitate the child's active participation in developmentally appropriate activities, and then offer pragmatic, but creative ideas for incorporating devices and strategies into daily school and home routines.

Meaningful use of assistive technology is strengthened when the child's educational team and family members subscribe to a core set of shared beliefs regarding the value of assistive technology. These values affirm that: (1) assistive technologies are tools to enhance the child's capacity to productively engage in daily activities at home, school, and in the community; (2) assistive technology facilitates active participation, independence and inclusion; (3) effective use of assistive technology is IEP related and based on a collaborative team process requiring shared attitudes, consistency and commitment; (4) assistive technology is most beneficial when it is infused across the curriculum, rather than used sporadically or in isolated instances; (5) assistive technology is flexibly incorporated into classroom routines, but customized to meet the child's specific needs; (6) the use of technology should be fun, motivating, and meaningful to the child; (7) time will be regularly scheduled for planning and training; and, (8) assistive technology will reduce, not create barriers; therefore, its application will be monitored and reviewed on an ongoing basis.

The manual can be divided into three major sections: foundations, implementation and personnel training. Chapters 1 - 5 provide an opportunity to explore and review the **foundations** of assistive technology including relevance to real life tasks, legislative mandates which have created the framework for accessible technology services to people with disabilities, and the importance of a team-based technology selection and service delivery process. The reader is introduced to the specific assistive technologies for positioning, access, communication, play, and computer use that are available to enhance a child's independence and skill development. Chapters 6, 7, and 8 focus on **implementation** issues: curricular issues that foster and support a "big picture" approach to assistive technology use in educational settings; the importance of understanding the relationship between the IEP process, technology implementation, and functional outcomes for the child that are goal related, achievable, meaningful, and developmentally appropriate; and funding options available to school personnel and families to defray the cost of technology equipment. The final section offers assistance to school districts in their challenges for ongoing **personnel training**. Chapter 9 offers guidelines and suggestions for training personnel to become effective assistive technology trainers. The Appendices conclude with specific "how to" instructions for creating many of the low cost and simple technology items mentioned throughout the manual.

I.

INTRODUCTION TO ASSISTIVE TECHNOLOGY AND EARLY CHILDHOOD CLASSROOMS

OVERVIEW OF ASSISTIVE TECHNOLOGY

Technology can be defined as the application of scientific knowledge. Accordingly, all forms of technology are tools, which expand and augment human functioning (Mann & Lane 1995). There is no disputing that modern life in the Western Hemisphere has become both overtly and subtly dependent on technology, and that its effects have profoundly influenced the ways in which we travel, communicate, work, play, and attend to our personal needs. Technology contributes significantly to the infrastructure of our lives.

Until recently, persons with disabilities were less likely to benefit from modern technological advances due to barriers that were attitudinal as well as physical. For too long, persons with disabling conditions have been disaffected from the mainstream culture. However, this is changing! Significant progress has occurred due to three powerful and inter-related factors: (1) the emergence of a strong grass roots self-advocacy movement among people with disabilities ; (2) empowering federal legislation; and, (3) the availability of technology products and services specifically targeted for people with disabilities. The latter is known as assistive technology.

Assistive technology has been defined in several pieces of federal legislation as *"any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capacities of individuals with disabilities."* (Reference: Individuals with Disabilities Education Act Amendments of 1990.) In simple terms it means any device or adaptation which can be used to help a person with a disability engage in a major life activity or perform a desired task that he or she was previously unable to do. Assistive technology offers the tools necessary to support or increase independent access to education, employment, family, and community activities.

Table 1-1. Examples of Conventional and Assistive Technology

Conventional Technology	Major Life Activity	Assistive Technology
Electric Razor	**Self-care**	Button Hook, Built-up Spoon Handle
Cellular Telephone	**Communication/ Receptive – Expressive Language**	DynaVox: Voice Output Augmentative Communication Devices
Tape Recorder	**Learning**	Switch Activated Tape Recorder
Cannondale Mountain Bike	**Mobility**	Quickie Rx Manual Wheelchair
CD stereo System	**Self-Direction**	Jelly Bean Switch with Battery Adapter and Twirl-O Paint Toy
Washer Dryer	**Capacity for Independent Living**	Proxi System with environmental control unit modules. Computer control of home appliances
Computer and word processor	**Economic Self-Sufficiency**	IBM Screen Reader to "speak"

LEGAL MANDATES FOR ASSISTIVE TECHNOLOGY

During the past twenty-five years, several key pieces of federal legislation have significantly influenced the lives of persons with disabilities. Listed below are four major laws where assistive technology services are mandated and/or supported:

P.L. 105-17, Individuals with Disabilities Education Act (I.D.E.A)

This legislation amends P.L. 94-142 (Education of the Handicapped Act and P.L. 99-457 EHA Amendments) mandating a free, appropriate public education in the least restrictive environment for infants, toddlers, preschoolers, children and youth with disabilities. The IDEA requires school districts to provide - *without cost to the child's family* - a full continuum of services related to assistive technology: evaluation; equipment selection, procurement, maintenance and repair; and training for the student, staff, and family when assistive technology is included in the IEP or IFSP or is necessary for the student to receive a free, appropriate public education. The act was re-authorized in 1997. While there were no significant changes to the *definition* of assistive technology, increased emphasis has been placed on AT service provision. The need for assistive technology is to be discussed at each child's IEP meeting, and every IEP must contain a statement indicating that the team has considered whether the student requires assistive technology devices and services. If the IEP team (which includes parents as equal team members) determines that the student requires AT devices and services, then such devices and services should be specified on the IEP.

P.L. 101-336, Americans with Disabilities Act (ADA)

The ADA gives civil rights protection to individuals with disabilities. It is a federal anti-discrimination statute designed to remove barriers which prevent qualified individuals with disabilities from enjoying the same opportunities available to persons without disabilities in the areas of employment, public accommodations, transportation and telecommunication services. "Reasonable accommodations" including the adaptation of equipment and the use of assistive technology are required unless these accommodations create an undue financial hardship for the business or agency.

P. L. 93-112, The Rehabilitation Act of 1973 , Section 504

Title I of the Rehabilitation Act authorizes funding to states to provide rehabilitation services including evaluation, counseling, training and rehabilitation technology services to individuals who qualify for services. The recent amendments of the Rehabilitation Act (P.L. 102-569, 1992), now requires that all state vocational rehabilitation agencies provide a wide range of assistive technology services on a statewide basis. The technology needs of every individual must be addressed in his or her Individualized Written Rehabilitation Program (IWRP) which is similar in concept to the IEP.

P.L. 103-218, Technology-Related Assistance for Individuals with Disabilities (Tech Act of 1988)

The primary purpose of this law is to assist states in developing comprehensive, consumer-responsive programs of technology-related assistance and to extend the availability of technology to individuals with disabilities and their families.

ASSISTIVE TECHNOLOGY FOR CHILDREN WITH DISABILITIES

It is usually expected that in typical preschool settings, children will see, hear, speak, move and position themselves, play, manage developmentally appropriate personal needs, and manipulate objects in the environment. However, when these skills are compromised by a disabling condition, the child often lacks the means to purposefully engage in the educational and social routines of the classroom. Assistive technology can help a child compensate for motor, visual, auditory, communication, and learning disorders, creating a pathway for acquiring new skills and higher levels of independence. Assistive technology can provide even very young children with opportunities for interactive enjoyment of developmentally appropriate self-care, play, communication, and learning activities (Oberstein, 1995).

Teachers and parents who are unfamiliar with technology may express fears that assistive technology will limit the child's speech and mobility (Trefler, 1992). In response, it is important to understand that ***the goal of using assistive technology with young children is to enhance their ability to actively participate in their own life.***

Technology does not replace what a child is capable of doing independently, and its use will not prevent or inhibit a child from acquiring normal developmental skills. Instead, technology supplements the child's actual abilities and compensates for skills that are not yet present. By giving the child the opportunity to meaningfully participate in typical early childhood activities, the child is given a chance to strengthen existing skills, develop parallel abilities, avoid maladaptive communication patterns, and reduce self-defeating behaviors such as "learned helplessness" (Trefler, 1992; Blackstone, 1990).

According to Angelo (1997) when used with young children, assistive technology can:

- Make things easier to turn on.
- Help with seating or offer alternative play positions.
- Help a child play.
- Help a child communicate.
- Help a child to see or hear better.
- Hold things steady or in place.
- Help a child to be bathed, dressed or fed.
- Help a child with early learning.
- Help a child move.
- Help a child control things.

In the educational setting, carefully selected and consistent use of assistive devices facilitates:

- The child's readiness to learn.
- Greater likelihood of an inclusive school placement.
- More appropriate peer and social interaction.
- Independent environmental exploration and interaction.

Assistive technology is only a tool - not an end result. As with all other tools, its real value cannot be measured by mere possession; its worth is demonstrated by what the child is able to accomplish through its use!

CATEGORIES OF ASSISTIVE TECHNOLOGY DEVICES AND SERVICES

There are seven broad categories of assistive technology products that offer potential benefit to children with physical, sensory, speech-language, and/or cognitive impairments:

- Positioning equipment for posture and stability
- Access tools to operate and control objects
- Communication devices for speaking and writing
- Mobility aids for independent movement in personal and community environments
- Environmental control units for remote control of appliances and electronic devices
- Self-care devices to manage daily living needs such as eating, dressing, and hygiene
- Sensory aids for vision and hearing impairments

Although there are specific "stand-alone" technology products within each classification, there is often interdependency and overlapping of categories. Addressing the child's technology needs in one area may serve as a foundation for other technology applications. For example, it may be premature to use technology to address the child's communication needs without simultaneously looking at issues affecting positioning and access.

THE HIGH TECHNOLOGY / LOW TECHNOLOGY CONTINUUM

Assistive technology products are often considered to be either high or low technology based on their characteristics. Selecting low and high technology applications to enable children with disabilities to function at their optimal potential should not be an "either/or" decision. It is more helpful to view technology on a continuum where high technology is not seen as inherently better than low technology - each has its advantages as well as limitations. The technology selection **process** should focus on **what will most effectively meet and support the child's needs in a particular situation or environment.** However, it is important to understand the distinctions between high and low technology products. Keep in mind that items that appear to be relatively simple may have been derived from more complex forms of technology such as the lightweight composite metals used in manual wheelchairs.

Characteristics of Low (Light) Technology Devices

- Simple, uncomplicated components
- Non-electronically based or uses simple battery operation
- Limited features for a finite set of tasks
- Often constructed as a "do it yourself project", increasing availability of commercially available low tech items
- Items may have limited durability
- Device operation is relatively simple to learn without special training
- Relatively inexpensive

Characteristics of High Technology Devices

- Complex, sophisticated components
- Electronically based
- Variety of features
- Products are frequently available only through commercial vendors specializing in this type of equipment
- Durability is usually warranted for a specific time period by manufacturer
- Longer learning curve - operating the device may require special training
- Relatively expensive

Although a device may be technically simple to operate, this does not ensure that it will be used consistently, appropriately or in meaningful ways. Therefore, training in functional application strategies and monitoring on-going use of the technology product is an essential component of the service delivery process regardless of whether the device is low tech or high tech!

THE ASSISTIVE TECHNOLOGY ASSESSMENT PROCESS

The purpose of an assistive technology evaluation is to recommend a device or system that will best meet the child's needs. The ongoing process of selecting appropriate equipment, developing implementation strategies, monitoring the effectiveness of its use and ultimately, integrating the device into the child's' daily life, involves addressing a continuum of concerns including educational, communication, physical, sensory, motor, and family issues. Consideration should be given to all of the components that may impact on the child's ability to use assistive technology most effectively. With such a complex set of factors to assess, it would not be appropriate or wise for any one professional to independently make such recommendations.

A **team-oriented service delivery model** bases its decisions on the collective expertise of a diverse group of people who are knowledgeable about both the child and assistive technology. The IEP or ISFP team seeks out, values active participation, and utilizes information provided by the child, his or her family and caregivers, and other professional service providers in the device selection and training process. The members of the team will vary depending on the needs of the children and the educational setting, but consideration should be given to involving the following individuals and disciplines when appropriate:

- Child
- Parents, family members, or other caregivers
- Teachers
- Related services providers (OT, PT, SLP)
- Psychologist
- School administrator
- Nurse
- Physician
- Rehabilitation engineer
- Equipment vendors

The goal of using assistive technology with young children is to enhance functional capacities and promote the child's active participation in developmentally appropriate activities by eliminating or reducing barriers to independence. Therefore, it is important that the technology assessment process determines the internal and external strengths supporting the child's performance in activities, and then identifies the barriers preventing or impeding functional abilities. Strengths and barriers apply to the child, the environment, and the child's personal support network of family members and friends, school personnel, and other care providers. Zabala (1995) suggests the SETT Framework – consisting of the Student, the Environment, the Task and the Tool. The main idea is that the tool cannot be determined until complete information is obtained about the student, the environment and the tasks that the student is expected to perform.

Benefits of the SETT Framework:

- Provides a process
- Promotes a collaboration
- Honors all perspectives
- Uses common language
- Unites assessment and intervention
- Assists in justification of decision

Some Guiding Principles from the SETT Framework

- The primary goal of AT is the enhancement of capabilities and removal of barriers to performance.
- AT may be applicable to all disability groups and in all phases of education.
- The least complex intervention needed to remove barriers to performance should be a first consideration.
- AT itself can BE a barrier.
- AT is related to function, not disability.
- Assessment and Intervention form a continuous, dynamic process.
- Systematic problem analysis and problem solving are essential.
- Follow-up and adjustments are expected.
- AT does not eliminate the need for teaching social and academic skills.
- A team approach is required.

Components of the SETT

The Student

- What are the student's current physical, sensory, cognitive, and language abilities?
- What are the student's special unique needs?
- What does the student want and/or need to do?
- What motivates the student? What does the student like and dislike?

The Environment

- Does the physical classroom arrangement allow for maximum independence (or at least encourage partial participation)?
- Do group dynamics allow for interaction between peers?
- Do staff members clearly communicate expectations of performance?
- Does anyone have previous experience with assistive technology (students, peers, staff and/or family)?
- Is technical support and training available?

The Tasks

- What are the other students in the classroom doing?
- Preschool tasks typically revolve around routines and interest areas.
- Evaluate opportunities for increased participation during daily activities.

The Tools

- What changes can be made to the student's environment?
- How might the task be modified?
- What kinds of low-tech, or high-tech, options could be used as part of a total system?
- What strategies are currently being used by the student?

AREAS FOR ASSISTIVE TECHNOLOGY INFUSION IN THE EARLY CHILDHOOD CURRICULUM

Depending on the child's needs, technology can be used appropriately in many areas of the preschool curriculum. However, for the purposes of this manual, we are looking most closely at using assistive technology in three very specific domains:

- Augmentative and Alternative Communication (AAC) Devices (Chapter III)
- Adaptive Play (Chapter IV)
- Computers / Computer Access for Early Literacy (Chapter V)

We have selected these areas because play and communication are fundamental to the early childhood curriculum. Computers are a wonderful source of learning experiences for all children and their adaptability through hardware and software modifications makes them an especially important educational tool for children with disabilities across multiple areas of the curriculum.

OVERVIEW OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

Augmentative communication (AAC) refers to a wide variety of techniques and assistive devices that may be used to supplement or aid a person's ability to speak and interactively communicate (Burkhart, 1993). The American Speech-Language-Hearing Association (ASHA, 1989) defines AAC as "*an area of clinical practice that attempts to compensate (either temporarily or permanently) for the impairment and disability patterns of individuals with severe expressive communication disorders.*"

The use of AAC systems should be considered as:

a. A primary means of communication when the individual is unable to produce intelligible speech;

b. A supplemental method of communication for clarifying speech in unknown contexts and/or to unfamiliar communication partners; and/or

c. A transitional means of communication that facilitates the later development of speech.

Augmentative communication devices supplement the person's natural or **unaided communication** strategies such as:

- Spoken words or word approximations
- Facial expressions

- Gestures
- Formal or informal sign systems
- Eye gazing

Aided language systems include a wide spectrum of low and high technology AAC devices, such as:

- Manual picture / symbol / alphabet / word boards
- Eye gaze displays (E-Tran Boards, Vertical Eye Gaze Panel)
- Voice output devices: dedicated and/or integrated communication devices
- Print output devices
- Switch technology and scanning options

Use of augmentative communication devices in the early childhood curriculum benefits children with communication disorders in the following ways (Burkhart, 1993):

1. Allows children to acquire critical linguistic skills.

2. Enhances opportunities for participation in typical preschool activities such as story and circle time.

3. Provides opportunities for social interaction with other children and adults.

Guiding Principles for Using AAC Effectively

- Technology and augmentative communication systems are useless without appropriate training and a supportive environment.

- Augmentative systems are most effective when they consist of multiple systems.

- Vocabulary and symbol selection are ongoing processes.

- Augmentative communication is most effective if taught in an interactive and pragmatic format.

- Classroom and home integration are crucial to success.

- Success depends on the commitment of caregivers to devote time and energy to consistent use of AAC technology.

To achieve the goal of successful integration of assistive technology into the early childhood curriculum, the team needs to **shift the emphasis from individual devices to multi-component systems**. A multi-component/multi-modal system utilizes a variety of low and high tech devices and implementation strategies appropriate to the child's ever-changing needs.

0VERVIEW OF ADAPTIVE PLAY

School readiness skills - cognition/ problem solving, language, emergent literacy and numeracy, social and self-help, gross and fine motor abilities - are typically acquired in the context of play. We know that children learn best when:

- They are actively engaged.
- They are involved in "hands on experiences".
- Activities are pleasurable.

Children with disabilities often have limited opportunities for play and environmental exploration. This may be directly related to the developmental, motor and/or sensory impairments attributed to the disability itself, or a secondary effect due to isolation or segregation from peers. These children need to have their play supported in order to experience more active participation.

Adaptive play incorporates:

1. Physical modifications or adaptations to toys:
    - Using magnets attached to the toy and a metal cookie sheet to stabilize the toy and keep it within the child's reach.
    - Using battery adapters and single switches to control battery operated toys.
    - Building up or adding handles to enlarge the grasping surface of the toy.
2. Modifying the play environment:
    - Place the toys and play materials within arm's reach of a child in a wheelchair.
    - Use bright, contrasting colors to stimulate visual awareness.
    - Select symbols that reflect the child's world.
3. Using alternative play strategies - alone or in combination with the above:
    - Modify the rules of the game.
    - Use fewer game pieces - (e.g., fewer cards when playing Uno).
    - Simplify directions; use multi-sensory cues.

OVERVIEW OF COMPUTERS AND ADAPTED COMPUTER ACCESS

The use of computers in the early childhood classroom offers tremendous opportunities for the child to actively participate in new learning experiences related to literacy as well as to other areas of the curriculum:

1. Looking at books
2. Reading books
3. Drawing
4. Writing
5. Communicating about print materials and activities
6. Cooperative learning
7. Manipulative play (simulated)

Appropriate programs may provide:

- excellent graphics
- interesting sound effects
- music
- speech output
- interesting responses to student actions
- endless repetition
- delightful and sometimes unexpected animations
- active rather than passive learning opportunities for turn-taking and working in pairs

Computer access is available for all children through standard or adapted input methods, which include, but are not limited to:

- Standard keyboard / mouse
- Commercial keyboards for children
- Low tech keyboard modifications (flap switch, keyguards)
- Adapted mice
- Switch access / scanning technologies (Ke:nx, Discover Switch, Adaptive Firmware Card, scanning software, Click It!)
- Touch Screen technology
- Alternative keyboards (e.g., IntelliKeys, Power Pad, Unicorn Board)
- Speech / sound capability

The next chapters will provide more in-depth information about each of these areas. Remember, this is a **team** process, and learning about the technology tools and techniques available should not be the responsibility of any one person. As an evolutionary process, your classroom will reflect change based on the needs and interests of your students and staff.

II.

PHYSICAL ACCESS TO TECHNOLOGY

CLASSROOM CONSIDERATIONS FOR POSITIONING, SEATING, AND WHEELED MOBILITY

The ability to move our bodies is a crucial component of normal development. Physical disabilities which compromise a child's ability for self-positioning and independent mobility may also negatively influence the quality of other functional skills such as fine motor coordination and social interaction. Children with absent, delayed, or abnormal motor skills may need technology in the form of positioning devices and/or mobility systems to maximize their ability to participate in daily life activities (Trefler, 1992). According to Presperin-Pederson (1996), proper positioning is essential for:

1. Participation in functional activities. (Proper head and torso alignment free up the arms and hands.
2. Promoting physiological functioning (e.g., swallowing, digestion, breathing).
3. Decreasing the effects of abnormal neurological influences on the body (primitive reflex, muscle tone).
4. Accommodating absent or decreased sensation to prevent skin breakdowns.
5. Preventing or controlling orthopedic deformities (scoliosis, dislocated hips).
6. Providing comfort or increased tolerance of the desired position. (e.g., seated upright at a table).
7. Enhancing self-image, self-esteem, and socialization.

Addressing the positioning needs of children with physical and sensory impairments provides the foundation for utilizing technology in any environment, and may in fact, be a prerequisite for the child's successful use of switches, communication devices, and computers in the classroom. In some cases, positional supports eliminate the need for other forms of technology. Alternative positioning equipment does not only benefit children with obvious motor deficits. Although children with severe motor impairments many require significant positioning interventions, children with mild motor deficits may also profit from positioning strategies and devices. Consider the child with low muscle tone who has difficulty sitting upright in a regular classroom chair while coloring or gluing; fine motor skills and visual attention to task may be enhanced by the use of a chair with side supports. Regardless of the disability or functional impairment, proper positioning in the classroom (Trefler, 1992) facilitates a child's ability to:

- pay attention,
- move his/her head to hear and see ongoing events,
- shift weight or change positions,

- breathe with ease,
- place the hands where he or she wishes
- manipulate and control objects.

Positioning equipment provides external stabilizing or supporting forces to the head, trunk, pelvis, and extremities. As with assistive technology in general, positioning technology encompasses a broad spectrum of products ranging from simple modifications to the child's posture to highly complex seating systems. Categories of alternative positioning devices typically seen in the classroom include:

Standing Frames - allow children to change to an upright position and participate in functional activities typically performed while standing. The frames may be stationary or mobile and may also position the child in prone (face down) or supine (face up) orientation.

Walkers - provide upright support for walking, coordination, and promote safety.

Crawling Assists - support body weight allowing the child to use his arms and legs to explore the environment.

Floor Positioners - include wedges, bolsters, bean bags, etc. that place the child in prone, supine, and/or side lying positions to prevent muscle and bone deformities and promote normal movement patterns.

Sitting Equipment - promotes pelvic and trunk stability, freeing up the arms and hands for manipulative and self-care activities. Sitting equipment may include stationary chairs such as Rifton and corner chairs, customized seating inserts for wheelchairs as well as modifications to standard chairs for height and seat depth, cushions, and inserts or attachments to support the foot, back, buttock, or trunk .

Wheeled Mobility - allows the non-ambulatory child to be passively or actively transported between environments without being carried by an adult. Equipment in this category includes scooters, strollers, manual, and power wheelchairs. Wheeled mobility can be further subdivided into three categories:

- Dependent base - attendant propelled (strollers, travel chairs, etc);
- Manual base - can be user propelled via large wheels (usually in back); and
- Powered base - battery operated or more conventional motorized wheelchairs, scooters, and cars.

Allowing a child to self-propel a wheelchair depends on many factors which may include the child's age, motor skills, ability to follow directions, how and where the chair is being used.

Postural Changes Associated with Reflexive Movement Patterns

It is important to observe what happens to the child's total posture and motor control skills when the child engages in voluntary or involuntary movements. Head or extremity motion may elicit changes in muscle tone or trigger abnormal reflexive patterns of movement. These involuntary responses can affect postural alignment, interfering with the child's ability to use his head, hands, and eyes for purposeful activity (See Table 2-1).

Table 2-1. Patterns of Reflexive Movement

Body Part	Movement	Effect
Head	side to side head turning	Asymmetrical Tonic Neck Reflex (ATNR). One arm straightens (face side), other arm bends. This may result in spinal curvature and inability to separate arm from head movements.
Head	• upward head movement • downward head movements	Symmetrical Tonic Neck Reflex (STNR). • Arms straighten, legs bend • Arms bend, legs straighten Reduces tolerance for the seated position; child tends to slide out of the chair.
Head	Orientation of the child's head in space: • Forward movement of head (away from vertical) • Backwards head movement	Affects use of tilted or reclined position in seating system. Arms, legs and trunk bend- Tonic Labyrinthine Reflex Prone (TLRP) Arms straightens, body arches backwards - Tonic Labyrinthine Reflex Supine (TLRS)
Feet	Pressure under the balls of the feet	Straightening of the legs and hips - Positive Supporting Reaction - This makes it difficult for the child to stay seated in a stable sitting position with hips bent.

Selecting Alternative Positioning Technology for Classroom Use

Decisions regarding mobility devices - especially, walkers, wheelchairs, and custom seating systems are typically made by medical and rehabilitation professionals with limited input from classroom personnel. However, the school team will need to address classroom positioning issues as they relate to the child's physical requirements for comfort, postural stability, and participation in class activities. Positioning technology (Table 2-2) may be needed for the child to achieve his or her educational goals and should be documented on the IEP or IFSP. The team should determine:

- alternative positioning needs throughout the day (purpose)
- activities in which the child participates (note whether the participation is active or passive)
- length of time child is engaged in each activity
- postural challenges associated with functional activities
- health concerns requiring alternative positioning
- specific positioning devices/strategies which will address these needs

Postural Challenges Associated with Functional Activities

Unaddressed posture and positioning needs can affect the child's ability to use his or her head and limbs for functional activities (Fraser, 1994; Trefler, 1992). As was previously emphasized, a stable posture (typically in a seated position) is a prerequisite for successful use of access technologies. Classroom personnel should be aware of the signals that indicate postural difficulties and the subsequent need for alternative positioning technologies.

Once a plan for addressing the child's positioning needs has been developed and implemented, it will need to be re-evaluated on a periodic basis. It is also important to keep in mind that the factors contributing to posture and positioning are dynamic and can change throughout the day, affecting the child's comfort and functional abilities. Therefore, when alternative positioning equipment is used in the classroom, its effectiveness should be carefully observed and monitored. To prevent problems, school personnel should:

- Be aware of recent surgery or modifications to braces and splints;

- Monitor the child's fatigue level;

- Monitor the child's indication of discomfort: fussing, crying, mood changes;

- Monitor for loss of functional abilities: child can no longer operate the switch or toy;

- Monitor skin integrity for redness or abrasions;

- Not leave the child unattended in alternative positioning equipment;

- Observe for broken or missing parts on positioning equipment.

Table 2-2. **Technology for Positioning**

Problem	**Positioning Technologies**
Child slouches forward or sideways in the chair or has a noticeable rounded back posture	• use a chair with side supports • lateral foam inserts • firm seat and/or back cushions • custom seating system*
The child slides out of the seat.	• check for adequate seat depth • provide for flexed hip position • pelvic seat belts • custom seating system*
Child is unable to maintain an erect head posture.	• high back chair • head rest • foam neck supports • custom seating system*
Child's feet do not reach the floor, child squirms in the chair.	• use a foot rest or footstool • lower the height of the chair
Child hikes shoulders while seated at table or, Child has to raise arms to shoulder height to reach the work surface	• lower the table height • provide an alternative table top such as a laptray
Child maintains arms in straight position while working at a flat surface	• use a slanted work surface
Child sits forward when arms are resting on table	• lower the height of the table • consider shoulder, trunk harness
Random arm motions interfere with head control.	• place child's arms in lap • place arms under a table or laptray • secure the object to be accessed
Constant movement creates unstable posture.	• stabilize the more involved limb
When child's knees are together, posture is asymmetrical	• firm seat cushion • custom seating system*
Position changes elicit fluctuations in muscle tone and primitive reflexes	• midline presentation of objects • use inhibitory postures** with wedges, rolls, bolsters, etc. • custom seating system*
Non-mobile child who does not have a seating system	• standing frames • floor seaters • consult with family/case manager about referral to seating specialist or clinic
Child cannot get close enough to the table or desk	• check table height • adjust height of armrest • use a laptray

* Child must be referred to seating specialists

** Consult with occupational and/or physical therapist

Positioning the Child Properly in the Wheelchair

When a child in the classroom has a wheelchair or customized seating system, the teaching staff should know the correct way to position the child in the chair. Modern technology has made even manual wheelchairs highly sophisticated pieces of equipment. If you are unsure about the various components of the chair and how the child is to be placed in it, consult with the child's parents, occupational or physical therapist, or the seating clinic team. In general, the child will be properly positioned when:

- the child's pelvis is as far back in the seat as possible,
- the seat belt is properly fastened.
- all positioning belts are fastened,
- seating supports are in place,
- all attachments to the frame are secure,
- the chair is at the correct angle,
- the tray is in place,
- brakes are in locked position (when chair is stationary) for stability and safety,
- the child appears comfortable.

Troubleshooting Wheelchair Problems

It is important for classroom personnel to be alert for wheelchair problems that occur during school. Concerns should be shared with the child's family as well as members of the seating team. Things to note include:

- Broken, loose or missing chair parts.
- Skin redness that does not disappear in 15-20 minutes after child is removed from the chair (especially in children with diminished or absent sensation).
- Child indicates discomfort when placed in the chair; cries, becomes agitated.
- Changes in the child's physical condition.
- Child appears to have outgrown the chair.

ASSISTIVE TECHNOLOGIES FOR ACCESS

"Assistive technologies for access" refers to the way(s) in which the child with physical, sensory, or multiple disabilities will activate (turn on/off), manipulate and/or control the function of an object. Access technologies supplement or support emerging fine motor skills, or they may substitute for the child's inability to use his/her hands (or vision) for purposeful activities. For example, in the preschool setting, adapted access may be needed to enable the child to open and turn the pages of a book, grasp a crayon or paintbrush, turn on a tape player, stack blocks, place and insert puzzle pieces into a form board, interact with the computer, or make choices on an augmentative communication device.

Depending on the specific activity and the desired outcome, a variety of access strategies may be used to enhance the **child's active participation** during the school day. Access technologies span a continuum of low to high tech products that are often used in combination to produce a more effective system for the child. Access technologies may include:

- postural supports
- low tech modifications to the toy or object
- pointing devices
- keyboard modifications or alternative keyboards
- modified mouse or trackball
- single switches
- multiple switches
- joysticks
- sound or voice recognition systems
- battery interrupters
- environmental control units
- latch-timers
- device placement aids and mounts
- switch mounting systems
- modified software

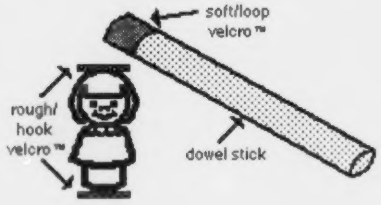
Selecting appropriate access method(s) and equipment is dependent on a complex set of factors which take into account the child's needs and adaptive responses in the areas of posture, motor skills, sensory processing, cognitive abilities, attention span, endurance levels, and social awareness. Adaptive responses are the child's abilities to interact with the environment (see Table 2-3). Assessment and observation of the effects of the child's sensorimotor skills on his adaptive responses should guide the school team as they make choices regarding the specific features of access technologies. For example, the child who has limited hand strength and ability to reach for things will need to access a surface that is highly sensitive to light touch.

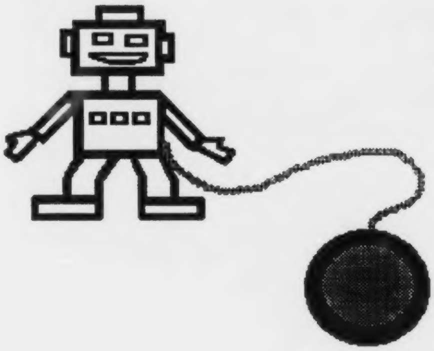
When an access plan is being developed, it is also important for classroom personnel to have a basic understanding of the child's diagnosis and precautions which may impact on the components of the access system such as sensation, skeletal fragility, pain, seizures, sensory defensiveness, etc.

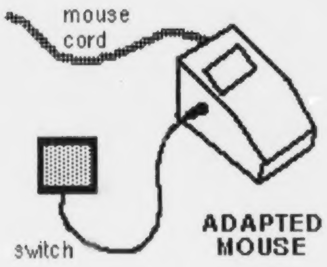
Classroom Considerations for Access

In the classroom, **team** decisions regarding access should be based on a systematic process that addresses several key elements:

- Classroom activities or tasks to be accomplished by the child.
- What object(s) or device(s) are to be accessed.
- Postural concerns affecting access.
- The body part and motion needed to operate the access system.
- Access methods (direct selection or scanning)
- Access technologies (specific devices and products).
- How and where the access system will be placed for most effective use.







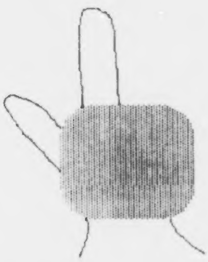


Table 2-3. Sensorimotor Considerations for Access Technologies (Oberstein and Hanser, 1995)

Adaptive Responses	Sensorimotor Components*
Postural stability in a variety of positions (wheelchair, floor, bed, chair, misc. positioning equipment)	Reflex Dominance Influence of Abnormal Tone Head and Trunk Control Range of Motion
Ability to reach, depress and release target or switch	Strength Range of Motion Visual Tracking Influence of Abnormal Tone Reflex Dominance
Response time for target or switch activation	Reflex Dominance Influence of Abnormal Tone
Targeting skills to select a specific target or switch	Praxis (Motor Planning) Reflex Dominance Influence of Abnormal Tone
Ability to visually locate system components	Visual Tracking Visual Fields Visual Perception Head Control
Attention to task	Auditory Processing Attention Span Sensory Defensiveness
Ability for sustained device use	Endurance Postural Stability

* Not an all-inclusive list of sensorimotor components.

Classroom Activities or Tasks to be Accomplished by the Child

Look at the classroom schedule and consider the child's type and quality of participation in the various activities throughout the day. As a team, ask the following questions:

- In which activities is the child typically an observer, or active participant?
- Do adults provide extensive hand over hand support for most fine motor tasks?
- Does the child avoid certain activities, or lack a way to play with certain toys?
- Does the child miss opportunities to participate in certain activities because of toileting, medical or other physical care schedules?
- What are the child's goals/functional outcomes on the IEP?

By observing the child and answering these questions, the team can get a clearer picture of where and when access technologies are needed to support a higher level of active participation on the child's part.

Object(s) or Device(s) to Be Accessed

The team will need to ask, "What do we want the child to do?" And consider which objects the child needs to access during classroom routines. Before modifying the access method, check to see if the child can actually use the toy or device in the customary manner. Whenever possible, it is best to try the standard control mechanism first, and then proceed with assistive technology in a progression of simple to complex adaptations.

Postural Concerns Affecting Access

As was previously emphasized, a stable posture (typically in a seated position) is a prerequisite for successful use of access technologies. According to Wright and Nomura (1985):

> "... a child's position directly effects the ability to control a movement, and therefore use a device. The primary reason for this is that the body needs a certain amount of stability before a motion can occur. This stability is usually provided from within the body, with its ability to maintain a position against gravity by using balance, equilibrium reactions, strength, and normal muscle tone. It is also made available through outside sources we rely on for support, such as a chair and floor when in a seated position."

When the child lacks adequate internal postural control mechanisms due to the physical disability, greater emphasis will need to be placed on using external sources for stability during access, and it will become necessary to consider using alternative positioning equipment described in the previous chapter. This should take place both prior to and during the selection of an access site. The latter is especially important because motor access abilities may change with shifts in the child's posture and position in space throughout the day.

Body Parts for Activation

The child's ability to activate a device - either directly or through switch use - is dependent on motor control. This can be defined as the ability to make some type of movement that is accurate, consistent, reliable, and repeatable. The movement must also be energy efficient, requiring the least amount of energy expenditure in order to prevent fatigue (Wright & Nomura, 1985). The school team must assess the child's ability to demonstrate **controlled, voluntary movement** of one or more body parts (Fraser, et. al, 1994). While the hands are the body's primary manipulative organ, they may not be the best site for access in a child with severe motor impairments. The team may need to explore many different sites and varied movement patterns by evaluating for the presence and quality of controlled movement at the fingers, hands or arms, head, knees, feet, or other sites such as the mouth and voice.

Observation of the child involved in spontaneous or adult-directed play will provide indicators of the child's motor control and movement patterns available for access. Table 2-4 offers a description of potential access sites and motions as well as examples of assistive technologies that can enhance access skills.

Table 2-4. Potential Sites for Device Activation - Direct Selection or Switch Access**

BODY PART	SPECIFIC LOCATION	SPECIFIC MOVEMENT	ASSISTIVE TECHNOLOGY ADAPTATIONS
fingers*	palm or back surface	gross extension	enlarged keyboards or target areas
finger *	fingertips, pads	finger extension	mini keyboard, keyguards, pointers, finger isolators, wrist supports, splints, stabilize forearm, secure other arm
hand *	palmer surface	small, controlled movement of mouse or trackball; depress activation key	adapted mouse or trackball
hand	under palm	downward hand pressure	switches; switch mounting devices
hand	next to palm	move hand sideways	"
hand	next to the back of hand	move hand sideways	"
forearm	outside	move forearm sideways	"
forearm	inside	move forearm sideways	"
elbow	outside	sideways elbow movement	"
elbow	inside	sideways elbow movement	"
elbow	back	backward elbow movement	"
head	under chin	downward chin or jaw movement	switches; switch mounting devices
head	forehead	downward forehead movement	"
head	cheek	turn head sideways	"
head	temple	turn head sideways	"
head	side of face	same side head tilt (downward sideways motion of head)	"
head	side of jaw	opposite side head tilt (upward sideways motion of jaw)	"
head	between chin and lower jaw	mouth closure; upward jaw movement	"

BODY PART	SPECIFIC LOCATION	SPECIFIC MOVEMENT	ASSISTIVE TECHNOLOGY ADAPTATIONS
head	back	backwards head movement	"
knee	outside	sideways knee movement	"
knee	inside	sideways knee movement	"
knee	above	upward knee movement	"
foot *	bottom surface	small, controlled movement of mouse or trackball; depress activation key	adapted mouse or trackball
foot	anywhere within reach of footrest or floor	kicking motion of foot	switches; switch mounting devices
foot	ball of foot	downward pressure	"
foot	beside big toe or little toe	sideways s motion of foot	"

* most commonly used access sites for direct selection
** Adapted from *Physical Characteristics Assessment Checklist,* Fraser, et al., 1994.

ACCESS METHODS

Access methods allow the child to control the various functions of a device including being able to turn it on and off, (toys, electric appliances) making choices (message selections on a communication device), or operating device features/functions (using menus on a computer program). There are two primary methods for access - direct selection and indirect selection (Angelo, 1997) which is used with scanning techniques.

Direct Selection is an access method where the child chooses the desired target with one selection in a single step (Doster, Politano, 1996; Angelo, 1997). This is usually accomplished by touching or pointing to the activation spot on the device. It can also involve directly looking at an item, referred to as "eye gaze." Generally, direct selection is the fastest and most cognitively concrete way to make selections. Typically the child will use some part of the hand or foot to make physical contact with the device. However, activation can also occur through the use of pointing tools, some of which are designed to be physical extenders of the child's body, while others function through sophisticated technology that allows pointing to, but eliminates the need for actual contact with the device.

Indirect Selection is an access method where more than one step (i.e., scanning) is required for choice making. The child activates single or multiple switches to choose among selection possibilities that are introduced one at a time or in groups. The choices are presented through visual and auditory modes. The child watches the movements of a light as it moves through each choice or she will hear part or all of each choice.

Scanning requires less motor ability, but higher cognitive and attending skills than direct selection. A developmental level of four years is needed for visual scanning and six years for auditory scanning. Scanning is typically used to control communication devices and computers when direct selection is not feasible. The components of scanning include the process, the pattern, the mode, and the rate. Scanning options are usually predetermined by the device manufacturer.

Table 2-5. Assistive Technologies for Direct Selection

Pointing Devices – Physical Extenders or Accommodations	Non-Touch Pointing Devices (High Tech)
Head pointers or wands	Optical indicators
Mouth sticks	Infrared or ultrasonic transmitters worn on the head or other body part (Head Master, Head Mouse, Tracker etc.)
Hand held pointers	Voice recognition systems
Keyguards	Mouse or emulator with on-screen keyboard
	Alternative keyboards (IntelliKeys, Key Largo, Unicorn Board, Tash Mini)

Scan Process

The scan process can be **preset** into an organized pattern and activated by single switch input, or **directed** to the target item by the user with a joystick or multiple switches.

Scan Patterns

The movement pattern of the scan indicator (visual or auditory) is referred to as the scan pattern. Frequently used visual scan patterns include:

Linear - The scan indicator moves item by item in line fashion.

Circular - The scan indicator moves item by item using a circular movement.

Row-Column - One row at a time is presented, when the row with the desired item is indicated, the user activates the switch, and each item in that row will be individually scanned.

Block - Similar to Row-Column, but instead of a row, a particular group of items is presented, when that groupis selected, the device presents a smaller group such as a row or individual items for selection.

Auditory - Used in conjunction with a visual scan pattern, the user makes a message selection after listening to a verbal prompt (part or the entire message). The prompt may be given privately via earphones, pillow speaker, or at a lower volume.

Scan Modes

The way the switch is used to start, stop, maintain the scan, and to select the target item:

Automatic Scanning - The user activates and releases the switch to start the scan and then waits while each item is presented. When the desired item is indicated, the user activates the switch again to make the selection.

Inverse Scanning - The user maintains switch activation while the items are presented and releases the switch when the desired item is reached.

Step Scanning - The switch is activated and re-activated to indicate each target item. When the desired target is reached, the user does one of three things depending on how the device is set up:

1. User pauses for a pre-set amount of time and the device automatically selects that choice.

2. User activates a second switch to select the item.

3. User activates the switch for a longer "on" time to select the item.

Scan Rate

Scan rate is the speed at which the scan indicator moves across the item choices. It is usually adjustable to accommodate the user's needs.

ACCESS TECHNOLOGIES

In the preschool environment, the most frequently used forms of access technologies include pointing devices, single switches, battery interrupters and latch-timer interfaces. Classroom staff using these items should have a basic understanding of the ways in which they work. According to Angelo (1997) there are at least four typical purposes for using switches with children:

- to teach cause and effect
- to teach children how to independently engage in activities
- to provide ways for children to participate in group activities

- to give children some measure of control over their environment

Switches

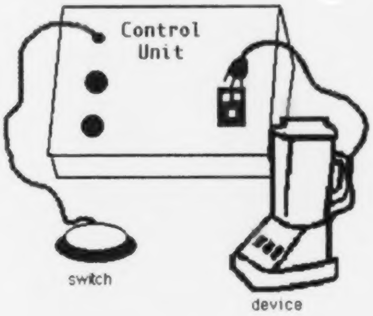
A **switch** is the on/off mechanism controlling the flow of electricity through the circuit pathway of an electrically (A/C or D/C) operated device. When the switch is in the **on** position, the circuit is **closed** or completed, and electric current is allowed to flow uninterrupted from the power source to the component which does the work (load). In the **off** position, the circuit is **open,** and the current pathway is broken, which effectively shuts down the device (Macomb Projects, 1993). For assistive technology purposes, switches are generally used as:

- An alternative method for bypassing a standard on/off mechanism which is inaccessible to the child.

- The method of activating scanning programs to control communication devices and computers.

Momentary Verses Latching Switches

With a **momentary** switch, the toy stays on only as long as the switch is pressed or activated (the circuit is closed). Releasing the switch opens the circuit and turns off the toy or device. Most adaptive switches are momentary. When a **latching** switch is activated, it locks itself into either the "on" or "off" position and the toy will stay "on" or "off" until the switch lock position is changed. Most off the shelf toys and appliances operate in this fashion.



Switch-Latch Timer Interface

This allows a momentary switch to be latched into the "on" position for a preset time period, eliminating the need for the child to maintain constant contact with the switch. The interface can be either A/C or D/C powered. Examples include the Ablenet Power Link 2 Control Unit and the Switch-Latch Timer.

Features to Consider When Selecting a Switch

There are many types of switches that can be purchased from commercial sources. It is important to understand the various characteristics of switches so that an appropriate choice is made for the child.

Force - Amount of force in ounces or grams required to make switch closure ranging from mere contact to substantial pressure.

Sensory Feedback - Information that the switch provides to the user to let the user know that switch closure has been achieved: auditory, tactile, visual, proprioceptive, etc.

Travel - The distance that the switch activation surface moves to make switch closure.

Durability - Ability to withstand repeated use without malfunctioning.

Size - Size and height of the switch activation surface.

Weight - Switch weight may affect how the switch is mounted.

Moisture Resistance - Saliva and other liquids can cause the switch to malfunction if it is not moisture resistant when used with a child who drools.

Cosmetic Factors - Appearance of the switch should be cosmetically pleasing to the child and age appropriate.

Safety - Avoidance of sharp or rough edges; placement of wires.

Mounting and Placement Options - Stability of switch on the mount. Ease of placement and removal from the mounting surface.

Battery Interrupters

A battery interrupter or adapter bypasses a device's on/off switch and consists of a copper wafer wired to a jack. It is placed into the battery compartment between one end of the battery and the metal contacts. An external switch is then inserted into the jack and the child is able to operate the toy or device such as a battery operated fan, bubble blower, or scissors. Remember that the toy's on/off switch must be set to the "on" position for the battery adapter to work.

Plugs and Jacks

The plug is the (male) end of the switch that connects to a jack (female receptacle) on the device. Plugs and jacks come in several sizes: 1/4", 1/8", and 3/32". A proper connection cannot be made unless a plug and jack of the same size are used. However, adapters can be purchased at Radio Shack to accommodate for size discrepancies.

PLACEMENT OF THE ACCESS SYSTEM

Following selection of the body part site, access method, and the specific access technologies, the school team will need to determine where and how the components of the access system should be positioned, secured, and transported. Just as the child's postural stability is important for maximizing motor efficiency, stable and secure placement of the access system will further support the child's ability to engage in functional activities. The access system components include the device, the mount for the device, the switch (if required), and the mount for the switch. It is important to keep in mind that more than one mounting system may be needed if the child will be using the device or devices in a variety of positioning equipment throughout the day.

Regardless of whether the child is using direct or indirect selection methods for access, the components must be placed *so that the child can activate the system with as little effort as possible* based on the child's optimal range of motor control abilities which include:

- strength
- reach
- targeting abilities (touch and release)
- best field of vision (if vision is needed to see the device or switch)
- better ear if auditory cues are needed
- appropriate height and distance from the child taking into account motor, vision and behavioral needs.

When deciding where and how to mount the system components, consideration must be given to several issues described below.

Permanence

For the purposes of this manual, device and switch mounts are considered to be permanent if there is a consistent, durable, method of attaching the components to the wheelchair or other surface which does not rely on a caregiver to manually keep it in place. In most situations a permanent mount is preferred as it helps to keep the components from becoming lost, and it reduces the chances that the device or switch will be dropped or incorrectly positioned. A permanent mount may also need to be adjustable or removable if it is to accommodate fluctuations in the child's physical status, if it is used for more than one access site, or in more than one location.

Stability

Mounts must be stable so that they hold the device or switch in such a way that they cannot be knocked about or pulled off by the child and that they remain securely in place while the child is being transported. The choice of fastening materials (Velcro, poly lock, clamps, screws, bolts, etc.) will depend on the size and weight of the system components, how often the set-up needs to be removed, whether the child is likely to voluntarily or involuntarily dislodge the system.

Supports Other Activities

The mounting system should not interfere with the child's other activities such as eating, transferring in and out of the wheelchair, toileting and using the laptray for reading, coloring, etc.

Easy To Remove By Caregivers

As children usually need frequent position changes, mounting systems should be easy to remove and re-attach by the child's caregivers. Ideally, the parts should snap into place without the need for tools or re-adjustments. Classroom staff should be taught how to handle the mounting systems.

Acceptable Appearance

The appearance of the mount should be pleasing to the child, age appropriate looking, and should blend in with the environment. It should not detract from seeing the child.

Safety

Mounting systems should be safe for both the child and caregivers. Non-commercially constructed components should be well-made to avoid sharp surfaces, rough edges and flimsy parts. Screws and bolts must be properly tightened, periodically inspected, and adjusted when needed. The system should not restrict the child's vision or allow components to contact undesired body parts such as the eyes or the mouth.

Specific Mounting and Placement Equipment

The assistive technology equipment used to position devices for access can be obtained through a variety of commercial and non-commercial sources. These products can be used off the shelf or they may require some degree of customization to meet the unique requirements of the individual child.

Table 2-6. Placement and Mounting Aids for Device Access

Device	Positioning Aids
Low Tech Generic Support (may be used in combination with each other)	• non-slip material - Dycem or rug backing • Velcro or poly lock fastener • lap trays • slant boards or easels • foam supports
AAC Devices	• Wheelchair mounts recommended by device manufacturer (Daessy, Communication Station, Macaw MiniMount) • Table or desk top mounts

Table 2-6. Cont.

Device	Positioning Aids
Switches	• Commercially available systems such as Ablenet's Slim Armstrong, and Universal Mount; Zygo Industries Adaptive Fixtures Kit; Crestwood Wheelchair/Table Mounting Kit; • non-commercial set-ups using gooseneck or CPVC tubing
Portability Aids for Ambulatory Children	• carrying cases and straps (most of the major AAC device manufacturers sell cases and or straps for their products, • wheeled carts (commercial or non-commercial)

III.

AUGMENTATIVE and ALTERNATIVE COMMUNICATION (AAC)

THE ABCs OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

The term "augmentative communication" may conjure up thoughts of when Johnny came to class with an electronic device that was too difficult to learn and too time consuming to implement in a functional manner. Some people may think that AAC means high technology and that the speech-language pathologist is the only one who can use the device with the child. The reality is that simple systems and techniques can be incorporated throughout the early childhood day. It will require planning, team sharing, and family participation to have an AAC-supported environment. However, both children who have special needs and their typically developing peers will benefit from the effort.

Before one can fully understand the scope of AAC, it is essential to understand the underlying language and communication which would be represented with such a system.

How AAC Fits into Our Knowledge of Language

If "language is a complex and dynamic system of conventional symbols that is used in various modes for thought and communication" (American Speech-Language-Hearing Association, 1983), then we can assume that children feel self-worth, learn about social relationships (child-to-child and child-to-adult), and learn academics through the understanding and use of language. As stated in the definition, "...various modes..." are used by all of us to communicate. Although most of us use verbal language as our primary mode, we also rely on other methods to convey our thoughts. Even when speaking on the phone when others cannot see us, we can use our tone of voice, pausing, laughing, etc. as some techniques to further convey our thoughts and feelings.

Unless someone brings it to our attention, we are not conscious of the various modes of language we use in our day to day interactions. Besides speaking to others we use hand gestures, eye gestures, written language, body language, etc. to further express our thoughts. This type of expression is termed **unaided** since it "requires no external device for production" (Lloyd & Fuller, 1986). Types of unaided communication include:

- speech
- vocalizations
- facial expressions
- manual signs
- gestures
- eye gaze

A person is said to be using **aided** communication if she "requires some type of external assistance such as a device for production" (Lloyd & Fuller, 1986). Examples include:

- objects
- line drawings
- word boards
- voice output devices

Augmentative communication then should be viewed in the sense of **multiple systems.** We communicate using multiple modes so it makes sense to expect, and encourage, children with disabilites to use multiple communication systems as well. The systems could include any combination of unaided and aided communication techniques. For example, if a child has a reliable means of expressing confirmation and negation then "yes" and "no" should not be represented on an aided communication system.

Multi-component systems offer flexible options and choices that also permit the child to be more effective in his or her communication interactions. In other words, the more ways a child has to communicate, the more likely he will be able to get his idea across to the listener. Multiple systems consisting of components from unaided and aided systems should be taught concurrently so that the child learns to move easily between systems as needed (Burkhart, 1993).

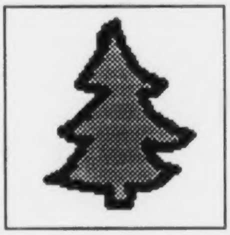
When considering an augmentative communication system for a child, initially address the child's communication in terms of communicative intent, including a means to request and reject. The following indicators will help in determining the child's current means of communication and intentionality. Does the child:

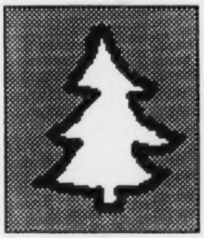
- gesture or point to indicate need,
- gaze to partner, then to desired item, then back to partner to make a request,
- use facial expression or vocalization in response to yes/no,
- point when asked "what do you want?"
- use word-like expressions with intonation patterns,
- demonstrate clear preferences for people, environment and/or activities,
- show frustration related to inability to talk,
- show sense of humor and enjoy acting silly,
- intentionally gain attention of others,
- protest when an enjoyable activity is stopped,
- reject a non-desired item,
- request assistance accomplishing a task,
- request a desired object that is visible,
- request a desired object or action that is not immediately visible, and/or
- greet people?

Language Representation

There are many modes of displaying language on an AAC system, depending on the individual's levels of functioning and communication needs. Moving from the most concrete level to the most abstract level vocabulary may be represented using:

- the actual object
- pieces of the actual object
- miniatures of the object
- photos of the actual object
- pictures and labels from magazines or containers
- line drawings
- textured symbols
- icons which can have multiple meanings dependent on context
- written words


COLORED FOREGROUND


COLORED BACKGROUND

The Picture Communication Symbols (PCS) available through the Mayer-Johnson Company are a widely used symbol set and are available both in reproducible book form and also as computer software (Boardmaker) for both IBM and Macintosh computers. These computer software programs provide options for printing colored or black and white symbols. When choosing to use black and white line drawings, it is suggested that the symbols be **color-coded** to enhance the visual distinction betweeen symbols. Color-coding is further suggested to aide the user in visually locating the symbols and as a means to learn syntax (parts of speech) since the symbols can be linked across the display for young children. Flourescent **highlighter pens** have been found to be the most effective for color-coding. The technique used is to color **around the symbol and the word** and leave the symbol itself white rather than coloring the symbol. This contrast makes the symbol more apparant and easier to locate.

There are two widely used color-coding systems, one is suggested by Mayer-Johnson and the other is suggested by Goossens', Crain, and Elder (1992). Both systems are described below and neither is felt to be superior to the other as long as there is **consistency** for the child both at home and in the classroom. One reason to use the Goossens', Crain and Elder system is that they have published activity-specific symbol display books which utilize manual board formats and formats for specific voice output devices (Communication Displays for Engineered Preschool Environments, Books I and II, 1994) in which they have arranged the symbols by color.

The **Mayer-Johnson** color-coding system:

Social (e.g. EXCUSE ME, THANK YOU)	pink
People (e.g. HE, SANTA CLAUS)	yellow
Verbs (e.g. COME, OPEN)	green
Descriptors (e.g. PRETTY, SLOW)	blue
Nouns (BIKE, HOUSE)	orange
Miscellaneous Wh-words (e.g. WHO, WHAT, WHEN, WHERE) Exclamations (e.g. UH-OH, YEAH) Prepositions (e.g. ON, OFF)	white

The **Goossens', Crain and Elder** color-coding system:

Verbs (e.g. COME, OPEN)	pink
Descriptors (e.g. PRETTY, SLOW)	blue
Prepositions (e.g. ON, OFF)	green
Nouns (e.g. BIKE, HOUSE)	yellow
Miscellaneous Wh-words (e.g. WHO, WHAT, WHEN, WHERE) Exclamations (e.g. UH-OH, YEAH) Negative words (e.g. NO, DON'T) Pronouns (e.g. I, YOU)	orange

It is recommended that **text** be displayed above each symbol as a means to enhance the child's literacy skills and to help adults easily locate symbols when modeling the vocabulary in the context of an activity.

INFUSE AAC INTO THE EARLY CHILDHOOD CLASSROOM

In the early childhood classroom augmentative communication is used to encourage **participation, attention, and interest** during classroom routines. It also gives the child **control** over the environment, increases **vocabulary**, improves **turn-taking**, and helps to develop early **literacy** skills. Goossens', Crain and Elder (1992, p. 15) indicate that AAC in the preschool setting should be:

- an integral part of ongoing classroom programming,
- used frequently, interactively, and generatively to express a wide range of communicative intents,
- used to communicate with classmates as well as school personnel, and
- designed and implemented in a time and cost-efficient manner.

Young children benefit from having a **predictable daily classroom routine** to experience success in transitioning and to build on their existing skills (Infant Child Communication Research Programs, 1995). Children who will be using augmentative communication will especially benefit from a consistent daily schedule to learn the language associated with specific activities. Vocabulary on the child's communication system can be selected from the activities within that routine. This vocabulary process needs to be well thought out and may be time consuming to develop based on individual children's needs. See the chapter titled "Assistive Technology and the Early Childhood Curriculum" to learn more about engineering the environment.

LOW AND HIGH AAC TECHNOLOGY

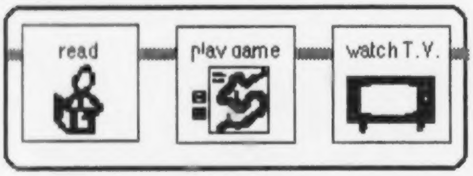
AAC is further divided into low (non electronically based) and high technology (electronically based) products.

Low technology AAC would include:

- props
- choice board with symbols
- language stimulation boards
- communication books, wallets, etc.
- remnant books
- eye gaze displays
- tape players with loop tapes
- single message devices
- dual message devices
- remote switch capability

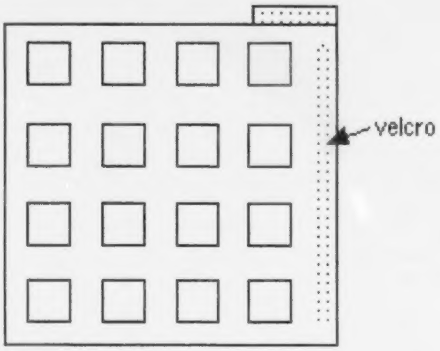
Props- Although this appears obvious, it cannot be stressed and encouraged enough that props be made to accompany activities presented to young children. Props gain attention, especially when the children can hold and manipulate them. Props can range from objects, felt boards, puppets, and pictures. They can be adult made or they can be constructed by the children during small group time using appropriately adapted equipment as needed for each child.

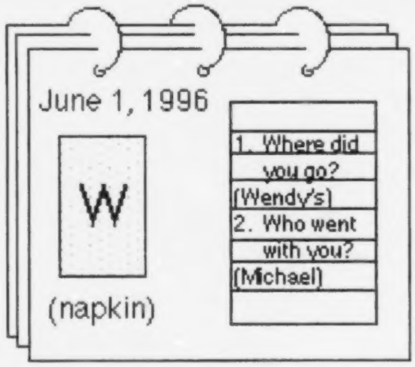
Choice board with symbols



A choice board is simply a piece of foam core art board cut into a 15" x 4" rectangle with a strip of sticky-back soft (female) velcro across the length of the front and back surfaces (see appendix for details). This provides a framework to then put individual removeable symbols or pictures to use for choicemaking. You can start with two choices and work up to more to fit an individual child's needs. You can also work on sequencing by putting the symbols for a song across the front and the child can make choices to "fill-in-the-blank" as the song progresses (i.e. "The Wheels on the Bus" song can be used with a symbol for "bus" and "town" spaced on the front and choices such as wheels, wipers, money, etc. and the movements put on the back for the child to pull off and put in the space left on the front to then sequence the song. (See Appendix A for instructions).

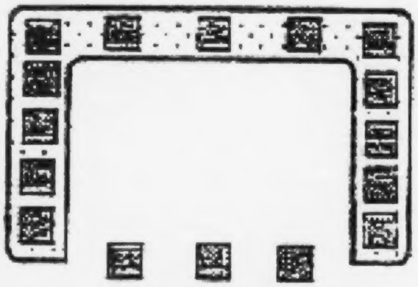
Language stimulation boards- As mentioned earlier, language symbol boards using activity-specific vocabulary can accompany most routines and activities conducted throughout the early childhood day. Since adults and peers will be modeling the vocabulary, rather than expecting language expression immediately, message pools of at least 16 words or phrases will allow enough language in the categories named in the color-coding section (verbs, nouns, descriptors, prepositions, and misc.) to model language easily.



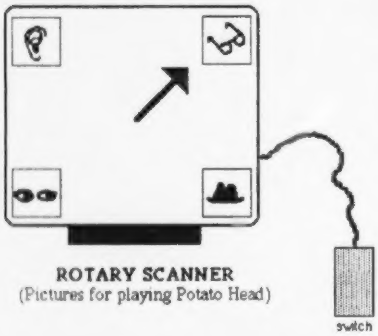


Remnant books- This is an idea that can be used as a topic starter between home and school environments. A notebook which contains page protectors is assembled and when the child participates in an activity that she would like to share, a portion of that activity (a napkin from a fast food restaurant, a ticket stub, etc.) is put in the page protector along with a note explaining the contents and some questions that can be asked of the child (be sure the child has a way to answer the questions!) (Blackstone, 1992).

Eye gaze displays- Eye gaze or eye pointing is a means of symbol selection in which the child looks at an object, symbol, etc. long enough for the communication partner to notice and then the child looks back at the partner to indicate that he made a choice. Eye gaze displays include **horseshoe shaped displays** made out of clear polycarbonate vinyl (Lexan) and then placed on a CPVC frame, and **eye gaze vests** (Goossens', Crain & Elder, 1992) which the adult wears. Children who have mastered eye pointing and are literate may have a system in which a display is divided into quadrants by color with letters of the alphabet on each quadrant. The child looks at the quadrant which contains the letter he wants and the partner then lists each letter in that quadrant until the child indicates the correct choice. This is obviously time consuming, but does allow a nonverbal, motorically involved student to express some novel communication.



eye point display



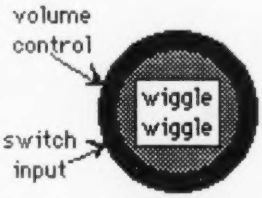
ROTARY SCANNER
(Pictures for playing Potato Head)

Rotary or clock communicators can be purchased from vendors such as Enabling Devices and require the child to use a switch to activate a dial which continually goes around until she releases the switch at her choice. The dial is on a square of plexiglass (generally either clear or black) in which choices can be attached using something like Sticky-tac™ which can be removed. The choices can be objects, photos, or symbols.

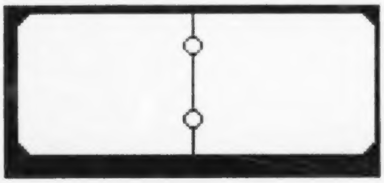
Tape players with loop tapes- A standard tape player can be accessed using a switch when put in the "remote" jack of the tape player. A 3/32 plug is required. If you need an adaptor, you may want to check Radio Shack for the size you need. An answering machine (message out) loop tape (10 seconds) is used to record a message which will never need to be rerecorded during an activity (e.g. the message "I want more to eat" can be programmed for snack and repeatedly used during the activity.)

Yeah
Yeah
Yeah!

Tape Player with Loop Tape + Switch



Big Mack

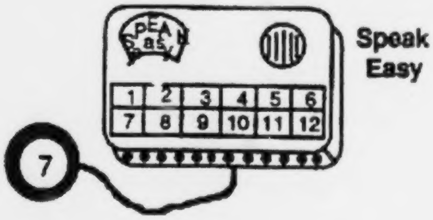


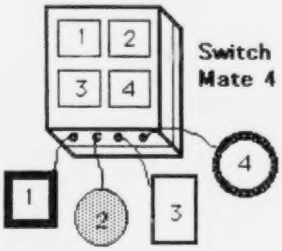
Say It

Single message and dual message voice output devices - There are some commercially available products which can record either a single message or two messages. Examples include the **BIGmack** (Ablenet) for single messages and the **Rocking Say It Play It** (Enabling Devices) for two messages. Both of these devices utilize digitized speech and have jacks to attach battery-operated toys. They are especially convenient during large group activities when voice output is needed, but may need to be changed rapidly to fit the situation. Repeated storylines and choice making (such as helper choices and song choices) are a good use of this type of voice output device.

Devices with remote switch capability- Devices which have several switch jacks can be valuable in the early childhood classroom to present a child with one target (a switch) rather than having the child visually scan and then choose from an array of pictures or symbols. For example, during a small group activity the teacher can have a **VoicePal Plus** (Adaptivation, Inc.) with up to 10 messages preprogrammed with vocabulary for playing a game. Each child playing would then have a switch with a picture or symbol velcroed to it with their particular message or command ("hurry up," "no cheating," "give me all your . . . " etc.). The **VoicePal Plus** holds 60 or 90 seconds of digitized speech on a single level (two models available), it can be configured to use 2, 4, or 10 message cells when using direct selection, 10 switch jacks for remote switch access, and models are available with auditory and visual scanning options. This device weighs 1.5 pounds.

Another example of a device which utilizes remote switch jacks is the **SpeakEasy** (Ablenet). The SpeakEasy holds up to 4 minutes of digitized speech on a single level, can configure to 2, 4, or 12 direct select cells, and has 12 remote switch jacks. This device weighs 1 pound.





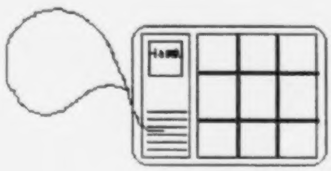
Other examples would include the **Action Voice** (Ability Research, Inc.), a **Switch Module** (Enabling Devices), the **SwitchMate** (TASH), an **AlphaTalker** (Prentke Romich) with a remote switch(8) adapter, and a **Mini MessageMate** (Words +).

High technology AAC would include:

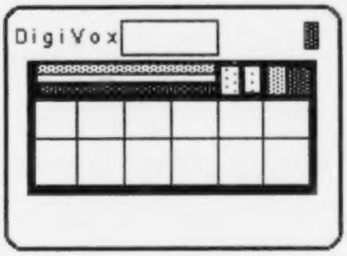
- single level voice output devices
- multiple level voice output devices
- dynamic display voice output devices
- Minspeak™ voice output devices
- text-to-speech feature or other coding system
- spelling-only systems
- computers with communication software

High technology systems include "dedicated" and "integrated" or "multipurpose" technology. Dedicated systems are used for the purpose of communication only. Integrated or multipurpose systems include communication as just one of the components. Integrated systems include computers with communication software or a device with the ability to interface with computers. They may also include the ability to control electric appliances (such as turning on and off lights, radios, kitchen appliances, etc.) (K. Flippo, K. Inge, & J. Barcus, 1995).

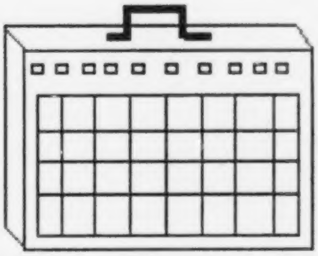
Single level voice output devices-These devices have the capability to store just one level (or 1 "page") of vocabulary. When activities change and different vocabulary is needed, the device would then need to be reprogrammed. Examples of this type of device include the **VoicePal** (Adaptivation, Inc.), **SpeakEasy** (Ablenet), **CheapTalk** 4 or 8 (Enabling Devices), the **Hawk** (Adamlab), the **MessageMate 20** or **40** and the **Mini MessageMate** (Words +). These devices all utilize digitized speech.



Hawk

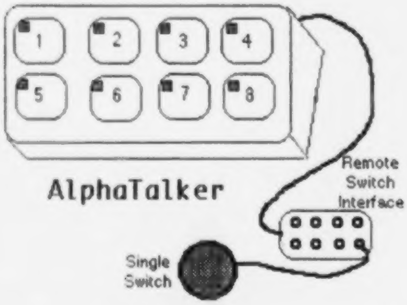


Multiple level voice output- Levels can be compared to pages in a book, with each page having a new set of information. Generally, a different overlay is created for each level and must be changed accordingly. Devices can range in the number of levels you have available. For example, the **BlackHawk** (Adamlab) has 4 levels with a total of 4 minutes of recording time with 16 message cells per level; the **SuperHawk** (Adamlab) has up to 72 levels with 12 minutes of total recording time and can configure from 1-72 message cells; the **DigiVox 2** (DynaVox Systems) has 48 levels with a minimum of 16 minutes of recording time up to 142 minutes and can configure from 1-48 message cells; the **Macaw 3** has up to 32 levels with either 9 minutes of recording time or the **Macaw 3+** has 19 minutes of recording time and can configure with 2, 4, 8, 16, or 32 message cells; and the **MegaWolf** (Adamlab) has 4 user areas with up to 36 levels **each** depending on how much memory you use per level and can configure from 1-36 message cells.



Macaw

Dynamic displays- These dedicated devices have a computer screen that shows pictures, symbols, and text in computer graphics. To select message cells, or electronically change pages, the user touches a predetermined location on the screen or activates a mouse or switch. A dynamic display may also include animated symbols. These devices allow flexibility in terms of the number of cells per page, nearly unlimited branching between pages, preset options per page, and use of digitized and synthesized speech. Much forethought and planning needs to go into organizing the branching system of these devices prior to doing any programming. Sufficient vocabulary and branching should be provided at the child's level without overwhelming her, yet leave room to add to the pages as the child's skills and needs expand. Examples of dynamic screen devices include the **DynaVox 3100** and the **DynaMyte** (DynaVox Systems) and the **Pegasus Lite** (Words +).



Minspeak™ devices- Vocabulary storage using Minspeak™ uses the sequencing of multi-meaning icons (semantic compaction) to communicate messages around a particular theme or topic. For example, the category of "Food" would start by activating the message cell with the icon of the "Apple." You can then narrow down the type of food within the category such as "Apple" + "Cactus" + "Noun" would retrieve the category of Mexican Food in the Unity Application Program. The icons help the user to remember where vocabulary and messages are stored by representing some part of that message. The selection of a particular sequence determines the message outcome, without the need to constantly change overlays. Devices which utilize the Minspeak™ or semantic compaction language system include the **AlphaTalker** (although this device can also be programmed according to levels since it uses digitized speech) the **DeltaTalker,** the **Vanguard** and the **Liberator II** (all by Prentke Romich Company). The DeltaTalker and Liberator II utilize synthesized speech with some limited digitized speech as well. There is vocabulary software available for these devices so that the user can have prestored sequences available and then can add additional customized messages.

Text-to-speech and other coding systems- Text-to-speech simply means that whatever the child types using the keyboard will be displayed in a window on the device and then spoken when the command is given. Morse code and abbreviation expansion (the first letter of each word is typed and the preprogrammed phrase or sentence is spoken) are other means of storing and retrieving messages. The **Link** (Assistive Technologies, Inc.) uses text-to-speech and abbreviation expansion.

Spelling-only systems- Some small and very portable dedicated systems have just a letter keyboard and a display window to use spelling rather than symbols as the language representation system. This allows the user to generate entirely novel information, assuming the user is a speller, but it is a very slow means of conveying information. Word prediction programs are available which help reduce the number of keystrokes. The user types in 1 or 2 characters and a list is displayed which has words which begin with those letters. The user chooses a number if the desired word is listed, hence not having to spell out whole words. Examples would include the **Lightwriter** (Zygo) and the **Say-It-All** (Innocomp).

Computers with communication software- Augmentative communication systems need to be highly portable to allow the user access in all environments. Desktop computers, although a valuable learning tool, do not suffice as a communication tool for an individual. Laptop computers, however, do fill this integrated role when appropriate software is purchased. Programs for IBM computers such as **Gus!** (Gus Communications) and **Talking Screeen** (Words +), and programs for Macintosh computers such as **Speaking Dynamically** (Mayer-Johnson) are examples of programs which allow the laptop computer to be used as a dynamic display augmentative communication device while simultaneously providing full computer access.

Two resources which list all available AAC devices and their features are available through:

Applied Science & Engineering Laboratories
University of Delaware/A.I. duPont Institute
1600 Rockland Road
P.O. Box 269
Wilmington, DE 19899
Phone (302) 651-6830
Web site: http://www.asel.udel.edu

Trace Research & Development Center
Rm. S-151 Waisman Ctr.
1500 Highland Ave.
University of Wisconsin
Madison, WI 53705-2280
Phone (608) 262-6966
http://www.trace.wisc.edu

AAC TO ENHANCE BOTH RECEPTIVE AND EXPRESSIVE LANGUAGE

AAC should be used to develop both a child's receptive and expressive vocabulary and language skills. We cannot expect a child to begin using an AAC language system just because one is provided! We first need to model the vocabulary and show the child how to use the augmentative system interactively. Adults and peers need to use the system as they talk to the child. For example, during diaper changing the adult talks about what she is doing and points to symbols corresponding to her words on a symbol display specific for diaper changing. If the child is learning sign language as well, then the ultimate teaching strategy would be for the adult to talk, sign, and point to symbols on a display or voice output device to model all modes of communication for that child.

Avoid common AAC traps:

- Infrequent use of communication boards
- Initiations frequently overlooked
- Limited range of communicative functions
- Expecting no more than yes/no answers to questions
- Speaking partner controls interactions
- Closed-ended questions predominate
- Minimal child to child communications

"Aided Language Stimulation" is a teaching strategy in which the facilitator highlights symbols on the user's communication display as he or she interacts and communicates verbally with the user" (Goossens', Crain, and Elder, 1992). This technique eliminates the need to "test" a child by telling him to "look at" or "find" words on his display. It allows for frequent interactive use of the system throughout the routines of the day (both at home and at school).

Goossens', Crain, and Elder (1992, p. 102) suggest the following guidelines when modeling language for children who are cognitively functioning below the 2 year level:

- Use primarily single words (symbols) and short grammatically correct phrases (symbol phrases) to talk about what the child is hearing, seeing, doing and feeling.

- Speak slowly, inserting numerous pauses into the conversational flow.

- Use lots of repetition as you describe ongoing events.

- Whenever the child indicates something nonverbally, provide the child with the single word (symbol) needed to communicate the exact same intent. For example, when the child looks at the cookie jar up on the shelf, you could say "cookie" as you point to it then repeat it again as you make the sign for cookie.

- Whenever the child indicates something with a single word (symbol), expand that message into a semantically equivalent two-word (symbol) combination.

Pictures and symbols can be used in such a way as to be a powerful strategy for improving language and behavior in many populations of children who have disabilities. Not only can symbols convey instructions, but they can also serve as a medium to improve a child's ability to follow directions, help him feel organized in his environment (daily schedules and/or tasks to complete), and symbols can ease transitions by giving children a visual representation. An excellent source of information for developing these strategies has been written by Linda A. Hodgdon (1995).

When teaching expressive use of an aided communication system, there are many types of prompts that can be used to encourage use of the system. Table 3-1 lists and describes types of prompts arranged from the least to the most intrusive (Herrera, 1995).

It is important to use the most effective but least intrusive prompt when encouraging a child to use a communication system. Experiment with the various levels of cuing and determine what works best for a particular child. The end result we all strive for is that the child will not need prompts after a given period of time. With this in mind, look to fade the prompts over time to foster independence. For example, a child may require hand-over-hand assistance during a large group activity to activate the message on her SuperHawk which says "I'm here" when attendance is called. After a few weeks the cue can be faded to a search flashlight cue and over the next months, maybe pausing is all that is required for her to activate the message.

Table 3-1. Prompts Used To Promote Spontaneous AAC System Use

Type	Description	Advantages	Comments
Contextual Cues	The naturally occurring activity or environment serves as the cue	This is the least intrusive prompt	May be too subtle to achieve desired effect
Gestural Prompts	Pointing in the *direction* of the communication device	Non-intrusive visual cue	Learner must visually attend
Flashlight Cues	A flashlight is used to direct attention to a general or specific area of the device	Relatively non-intrusive	Person may be distracted by the light
Indirect Verbal Prompts	The facilitator may: offer information, express feelings, socialize, tease or sabotage	Relatively non-intrusive Interactive	Sabotage may backfire
Modeling	The desired response is demonstrated by pointing to or looking at the symbols.	Relatively non-intrusive visual cue	Learner must visually attend and imitate
a. **Third party modeling**	A child or inanimate object is used to pattern the correct response		
Direct Verbal Prompts	Questions Directions Statements	Easy to deliver Can be consistently used Can be documented	Distracting to others in the environment Learner must auditorially attend and follow directions
Physical Assistance	Includes a range of physical contact from light touch to hand over hand assistance	Ensures success Helps to prevent errors.	May create dependency May be difficult to fade Intrusive

Some other hints for encouraging conversation include:

- Provide opportunities for the child to initiate interaction. This could mean having topic setter cards that are child-specific, topic setter messages on a child's device, as well as games, jokes, or song starters.
- Include opportunities for social "chit-chat."
- Provide opportunites for turn-taking, such as providing post-it notes with questions, follow-up manual symbol or choice boards, and/or follow-up on a child's device.

- Train strategies to regulate conversation. Provide messages that tell the communication partner to wait, let them know if it is ok to guess the message, indicate if the partner has misunderstood, and provide a "clue" page.

- Provide "low tech" back-up strategies. Use sign language or gestures, symbol dictionaries, communication inventory for unfamiliar partners, an alphabet board, first letter cuing, and/or communication symbol boards, wallets, or cards.

Classroom teachers and support staff can arrange the communication environment to allow for optimal device support by understanding the roles of a communication **facilitator** and a communication **partner**. The communication **facilitator** is the person who makes sure the device and user are ready. This includes 1) designing and programming overlays/pages with appropriate vocabulary, ensuring that the device is charged and ready, and helping the child get to the correct overlay or page prior to the activity or interaction; 2) making sure the user is ready for the interaction by teaching applicable concepts, allow for practice of the vocabulary, and teach strategies for rate enhancement if applicable; 3) make sure the environment is ready by providing training for the communication partner if needed, put hints for the partner on the device, and help the user find a position where he can see the partner and access the device; 4) cue appropriate device use during the interaction by providing the least level of prompts needed for success (see Table 3-1).

The communication **partner** is the person who is interacting with the device user. Her role is to 1) show respect for the user by using age-appropriate language and tone of voice as well as expect a response and don't "talk down" to the user; 2) ask open-ended questions; 3) provide frequent pauses to allow the user to have a turn to talk; 4) provide opportunities for turn-taking; 5) accept multi-modalities of communication; 6) and allow the facilitator to cue device use rather than specifically asking the child to use the device.

The following is another hierarchy to facilitate conversational interaction in which pausing is the prompt or cue given (Adapted from D. Herrera, 1995):

1. Attend to child and **pause**.

2. Converse (socialize, offer information, express feelings, tease, or pretend, etc.) and then **pause**.

3. Express expectation for the child to formulate a message (attempt to establish a general message area), and then **pause**.

4. Suggest possible specific message area, and then **pause**.

5. Suggest possible message areas modeling the augmentative communication technique, and then **pause**.

6. Provide physical guidance.
   or
   Ask a WH question (who, what, where, when, why, and how), and then **pause**.
   or
   Provide a gestural prompt and then **pause**.

7. Ask a yes/no question and then **pause**.

DETERMINING APPROPRIATE AAC: SETT & THE FEATURE MATCH APPROACH

The evaluation process for a communication system should be **ongoing,** since the children who require augmented communication will be growing and changing, in terms of their language understanding and usage, and their systems will need to be adapted accordingly. To determine a voice output system that is best matched to a child's needs, an evaluation is conducted by a team consisting of parents and professionals with a concensus reached regarding the appropriate device to meet the child's needs. With documentation of the child's abilities during the evaluation in an activity-specific format using various voice output devices, and with the parent and professional opinions, a recommendation is made.

- A **transdisciplinary** approach allows each team member to bring his or her professional expertise and viewpoint to the assessment process, but the team operates under the philosophical premise of role release, blurred professional boundaries, and shared collaborative decision-making.

- The assessment should be a **collaborative** process between the evaluation team and those individuals who are significantly involved in the child's life. This would include parents, teachers, aides, school therapists, and group home/vocational staff.

- An **activity-specific** evaluation involves assessing device use while participating in an activity rather than in a traditional question/response format. This allows the child to be more comfortable in an unfamiliar situation. Motivating activities enhance child participation in the assessment process. Therefore, thorough information regarding communicative intent and typical behavior can be gathered to formulate an accurate device feature-match based on the child's needs.

- The evaluation team should be **flexible**. Recommendations for appropriate devices are based on a matrix of complex issues that will vary with each child.

The **Feature Match Approach** is the process of assistive device selection where the needs of the user are assessed, documented, and matched to the device which most closely offers the required features. The **SETT** approach, refers to determining Student needs, Environmental considerations and Tasks for communication before deciding on a particular Tool (i.e., communication device).

Table 3-2. AAC Device Selection (SETT and the Feature Match Approach)

The Student

Current Functional Status

- Communication profile
- Cognitive performance
- Sensory systems
- Motor abilities

Environments and User Positions

- Positioning status

Positioning environments

- Positioning equipment

The Environment

Locations for Device Use

Classroom, at a desk or computer terminal, from across the room, in multiple rooms, at home, in community locations, in a car or van

Communication Partners

Single or multiple, with sensory impairments, with mobility impairments, unfamiliar with device, with limited time or patience, at a distance

Special Considerations

Living arrangements, previous AAC experience, family and school support, training issues

The Task

Message Needs

Call attention, signal emergencies, convey medical needs, greet people, make requests / choices, provide unique information, carry on a conversation, express emotions, give opinions, prepare messages in advance, repair communication breakdowns, complete assignments

Modality of Communication

Prepare auditory messages, written messages, change modalities, talk on the phone, communicate privately

The Tools (Features)

☐ Smallest size cell =
☐ Max number of cells per page =
☐ Symbol set = objects, photos, line drawings, Picsyms, color-coded symbols, multi-meaning icons
☐ Understands dynamic page changes
☐ Selection technique = direct, keyguard, remote switch, step scan, automatic scan, directional switches, mouse, alternative mouse, auditory scan, other ____________

☐ Mount for switch
☐ Mount for device
☐ Easy to re-record
☐ Pre-programmed messages
☐ Quick retrieval system for sentences
☐ Single level
☐ Multiple levels
☐ Spoken output (Digitized or Synthesized)
☐ Hard copy printed output
☐ Volume control
☐ Visual display on device
☐ Local training / technical support
☐ Easy to program from the start
☐ Easy to customize
☐ Highly portable

☐ Amount of memory needed =
☐ User has access to all vocabulary on one page
☐ User changes pages independently
☐ User lock-out features
☐ User can program new vocabulary
☐ User can compose novel messages word by word
☐ Text-to-speech (synthesized speech)
☐ Rate enhancement /Coding system
☐ Access to symbols and spelling
☐ Environmental controls
☐ Computer access
☐ Can backup vocabulary on computer

Student

Table 3-2 indicates skills in a broad range of areas which will help to determine which system features will be required by a specific student. Motor and sensory skills will determine the size and number of cells on a particular display. Cognitive, sensory and communication skills will influence the representational system (i.e., type of symbol) as well as method of storing vocabulary (e.g., dynamic or static vocabulary systems). Student position throughout the day will influence how she will have access to a communication device and determine what type of mounting system will be necessary.

Environment

The variety of locations for communication may influence the need for pre-stored vocabulary. The greater the expectations are for communication across activities, the more likely a student could benefit from a communication device with pre-stored levels of vocabulary. Environments that are supportive of technology, including partners who are either already experienced or eager to attend trainings, are more likely to support devices with complex vocabulary storage. The communication devices whose companies provide quality technical support and training are usually considered before those who have little support.

Task

As indicated above, the variety of locations influence the type of message that a student is required to produce. This may result in the recommendation for a device with pre-stored vocabulary on multiple levels. These messages may also be influenced by the student's physical and cognitive abilities. Students with severe physical limitations may need to learn early how to turn on and off battery or electrical devices through the use of a switch and/or the communication device. Those students who have developed at least rudimentary spelling skills should have access to keyboards that will allow them to compose their own messages. In many cases, a student who has the capability or demonstrates great potential to use spelling should have access to a communication device with synthesized speech output.

Tools: System Design and Features

The following information will help clarify some of the vocabulary used by companies and manufacturers when describing particular device features.

System Process - This refers to the communication functions performed by the system including the type of representation used for vocabulary (symbols, icons, text), user programmability, dynamic vs. static display, memory for storage of messages, text-to-speech, and coding systems (such as abbreviation expansion and morse code) to expand and accelerate vocabulary selection.

System Output - This refers to the means by which the message is transmitted or conveyed to the communication partner.

1. Synthesized speech

Computer generated speech based on "text-to-speech" translation (what is typed into the device gets spoken). Low quality speech tends to sound very "robotic". High quality synthesized speech such as **DECtalk** provides more natural human sounding voice and the user has the options of selecting between a range of male, female, child or adult voices. Synthesized speech capability can allow the device user to create almost unlimited amounts of novel messages.

2. Digitized speech
   Sound is electronically recorded (not synthesized) onto a computer chip. Large amounts of computer memory are required to produce good sound quality. However, sounds cannot be put together as in text-to-speech, and each word or phrase must be recorded for the device to "speak" it. Storage of vocabulary is limited to a predetermined amount of recording time.

3. Visual Output
   a. text
   b. text displays
   c. pictures / symbols
   d. light(s)

4. Hard copy
   a. strip printer
   b. column and/or page printers

Portability / Interface Issues - Refers to how a user will be able to transport a system. Issues include:

1. Device design specifications
   a. size
   b. weight
   c. power supply
   d. standard or optional carrying accessories; mounting systems

2. User's mobility status
   a. independent ambulator with good balance
   b. independent ambulator with unsteady balance
   c. ambulates with assistive devices / physical assistance
   d. wheelchair user

3. Device flexibility
   a. multiple access methods
   b. computer interface / keyboard emulation
   c. compatability with other environmental controls (ECU capability)
   d. integrated controls for powered mobility

Device Trials

The evaluation is carried out in an activity-specific format and notes are kept with regards to the device set-up and access issues, including:

- type of device
- activity presented
- cell number and size
- keyguard
- representational system
- vocabulary
- child / device position
- direct selection / switch / scanning
- portability / mounting

For each device / activity presented, notes are recorded regarding the child's interaction and response including:

- contact with the device (initiation, exploratory, avoidance, intentionality, etc.)
- response to the voice output
- prompts and cues needed

Further consideration is given for how the child communicates during the evaluation and with whom. Also note other special considerations such as:

- behavior
- family/school staff response and comments
- discrepancy between performance during evaluation and caregiver reports
- bias toward certain devices

Before a particular device will be purchased by a funding source, the child's interest in and prognosis for using the device must be documented in a written report.

Report Writing

The following headings are included in AAC evaluation reports written by this team:

- Reason For Referral
- Diagnosis
- Hearing and Vision Status
- Background Information / Current Functional Status
- Present Communication Skills
- General Needs Assessment
- Required / Desired Components In A Device

- Assessment / Equipment Trials
- Discussion
- Devices Considered
- Summary
- Recommendations
- Goals

Assessment Materials

In the Special Interest Divisions, Augmentative and Alternative Communication, newsletter (American Speech-Language-Hearing Association) November 1995, Karen Casey listed "Materials You Can't Live Without" when conducting functional, play-based AAC assessments as follows:

Toys and Activities

- multisensory, battery operated toys
- simple, single function toys (balls, bubbles)
- multifunction toys (discovery cottage, car wash)
- pretend play toys (cooking, grooming)
- computer activities (switch, expanded keyboard)
- coloring, drawing activities
- storybooks
- songs

Symbols

- object representations (empty food or toy containers)
- food wrappers, box labels from toys
- photographs (colored, black and white)
- line drawings (several types): symbols for choices and activities, Sizes: 1' – 4', color-realistic and background, and individual symbols (with velcro)
- multimeaning icons
- communication boards of various sizes (choice boards, activity boards)

Displays

- plexiglass or vinyl to place over symbols
- velfoam board
- easel or upright board
- eye gaze frame (CPVC)
- eye gaze vest
- song strip
- large surface switches
- communication devices
- expanded/alternate keyboards for the computer

Access Tools

- variety of switches
- headlight
- headstick
- splints or adaptations for holding markers, spoons, objects, etc.

Equipment for Communication

- tape recorders
- loop tapes
- battery adapters and remote adapters
- multiple switch devices (Switchmate, Speakeasy, Switch AlphaTalker, multipleswitch box for computer)
- voice output devices

Supplies

- Sticky tac™
- cue light
- CPVC
- squeaker
- 02 vinyl (Lexan)
- foam straps
- tagboard
- velfoam
- velcro
- more velcro

Positioning Equipment

- corner and kinder chairs
- rifton table
- sidelyer
- mat
- danmar vest
- tumbleforms feeder seat
- carrie seat

FEATURE MATCH CASE STUDY

Background

Jackie is a 6 year, 2 month old girl with a diagnosis of schizencephaly, resulting in delays in all areas of development. Functioning was determined to be below the 12 month age equivalency in areas of physical, self-help, social, academic, communication and adaptive behavior skills. Movement patterns are characterized by both active and reflexive movements with fluctuations in her muscle tone. When positioned appropriately in her wheelchair (with shoulder and hip straps, lap tray) Jackie has some active and functional reaching, though hands are often fisted with the thumb adducted against the palm, and she has difficulty grasping and releasing items. A physical therapy note indicated severe spasticity. She is dependent for mobility, transfers and self care. Vision and hearing were reported as functional.

Expressive language skills are at the 18-20 month level and receptive language skill at the 22-25 month age range. Jackie communicates through eye gaze, gestures and vocalizations. At this time, her eye gaze is the most consistent and reliable form of communication. Her head movements for yes/no are not always discriminable, due to loss of head control if she drops her chin. Gestures using her arms also affect the tone in her whole body. Overall tone and spasticity have affected Jackie's ability to produce sounds for speech, resulting in vocalizations which consist mainly of open vowels with intonation. Due to Jackie's limited communication skills and improvements with single switches to activate cause/effect results with battery toys and computer programs, she is considered a good candidate for an augmentative communication device.

Equipment Trials / Assessment

Jackie tried a number of switches at various angles: Spec, Plate, Light Touch, Wobble, and Jelly Bean. She activated the switches with either the right or left hand, though her left hand was more relaxed than the right. She also operated a Big Red switch and a BIGmack, positioned at the far right corner of her lap tray. Jackie was able to maintain pressure on a switch to operate a hand mixer to make bubbles in a glass. However, her tone throughout her upper body was affected and she had difficulty releasing and activating the switch quickly. Five choices were programmed on a MessageMate 20, providing visual cues of the lights for scanning. A Left/Right Rocker Switch was positioned at the far right corner of her lap tray. She was instructed to push the left side to advance the lights and the right side to speak the message. Jackie was able to reach the right side better than the left, making this a difficult access mode for her. Using a 2-location format with automatic scanning, Jackie eye gazed to the item of choice, but had difficulty with timed activation of the switch to ask for it.

Access was also attempted with various switches positioned at the right temporal region of her head. Jackie was periodically able to maintain eye contact with the battery-operated fireman while activating the switch. Items for Mr. Potato Head were attached to the ladder for the fireman to select. Jackie was able to activate the switch with verbal and occasional physical cues to make him go and then stop at the appropriate time to select the items. She demonstrated the same difficulty with maintaining contact with the Wobble Switch to operate a battery blow dryer, though could activate the switch on command.

Four messages were programmed on the SuperHawk (Adamlab) with an auditory scan cue. The device scanned the initial word of each choice for food items at lunch. When an item was selected, the entire message was played (e.g., "juice, I would like some juice.") Jackie responded to the auditory choices and would wait until she heard something she liked. She then smiled and her eyes widened. However, Jackie had difficulty activating the switch when she heard her choice. A number of switch options were attempted: a Wobble switch and then a Jelly Bean at her head and a Big Red with her right hand.

A Light Touch switch (Don Johnston) was positioned at Jackie's right foot to activate the battery-operated blow dryer. Jackie was able to activate the switch at her foot with much more control and consistency than was seen with her hand. Overflow movements were noted in the left foot, and it was decided that we should move the switch to her left foot. Jackie was able to accurately activate the switch for single messages with her left foot. Using the DynaVox Classic in a four-location format, she had difficulty coordinating the motor planning to activate the correct choice, though was occasionally successful. When she came to the page with four choices of clothing items, she was initially asked to look at the item on an eye gaze frame. Then she tried to activate the device at the appropriate time to choose that item. It was evident that eye gaze was a consistent and reliable form of communication, while scanning will require more training to achieve appropriate motor coordination for timed activation.

An eye gaze frame with 13 color-coded PCS symbols was positioned in front of her. A flashlight was used to highlight each symbol as it was explained. The symbols consisted of single words and short phrases for balloon play. Jackie was able to quickly and accurately eye gaze to single symbols and sequence two symbols, following one model. She used eye gaze to these symbols to request, question and comment on the activity.

Discussion

Jackie demonstrates good potential for augmentative communication device use: she is socially aware, she follows directions, she has a consistent eye gaze to indicate choices, she is able to match pictures to objects. However, she has motor coordination and tone considerations that affect her ability to access a device. Although school reports indicate that Jackie would prefer direct selection with her hand rather than scanning, it was apparent that she does not have the motor skills to reliably do so.

Study Questions

1. Which access site would you recommend for Jackie?
2. Which method of access would you begin with?
3. Which device might be appropriate?
4. How could you use eye gaze to supplement communication?
5. How could you use battery operated toys to train switch control?

This case study will be continued following the adaptive play section.

IV.

ADAPTIVE PLAY

ADAPTIVE PLAY

We can all remember specific toys, games and friends we played with as we were growing up. Little did we know that we were developing our gross motor, fine motor, social, self-help, cognitive and communication skills as we enjoyed ourselves! Teachers and suppport staff of young children know the importance of play in the daily routine, yet children who can not readily join the play of others or manipulate store bought toys, frequently do not get a chance to participate in play. Typically these children spend a significant percentage of their school day receiving therapy services and only observe their peers following a different routine.

If we brainstormed ideas which would generate a definition of "play," the list might look like this:

Play is:

- fun
- natural
- self-motivating
- hands-on
- an integration of the senses
- a rehearsal of skills
- repetitious
- a means to expand skills in all developmental areas
- gives the child control over the environment

Using this as a working definition, it is easy to see that many children with special needs do not have as many opportunities to experience these benefits of play.

Stages of Play

A predictable sequence of play skills develop with children who are acquiring skills in a typical fashion. The following stages should be kept in mind when determining where each child is functioning developmentally in order to provide appropriate toys and modifications to meet their needs. Children who have special needs will tend to be scattered in their abilities across skill levels.

Westby (1980) describes the following stages for normal play development:

- Exploratory Play
- Functional Object Use
- Early Symbolic Play
- Advanced Symbolic Play

Exploratory Play - Involves manipulating toys and other objects like an infant, to experience new sights, sounds, tastes, and textures. Example: a baby shakes a rattle then puts it in his mouth; a one year old uses a spoon to bang on the bars of his playpen and a saucepan.

Functional Object Use - Refers to appropriate use of most common objects and toys. Example: a child might use a brush in her own hair, strike a zylophone with a mallet, or use a plastic hammer with a pounding bench.

Early Symbolic Play - Covers beginning pretend play, including pretend use of imaginary items. As they progress in this stage, children begin to play with dolls, or to combine two toys while playing. Example: early samples include pretending to go to sleep, or drinking imaginary juice from a cup. More advanced play would be feeding a stuffed bear or putting a spoon in a bowl to dish out imaginary food.

Advanced Symbolic Play - At this stage, children begin to act out routines of their daily experiences, such as “playing house.” Later samples of this stage show activities that are less familiar, such as “playing doctor.” At first, toys and play materials are fairly realistic and life-sized. Later, children use miniatures, such as Fisher-Price™ play sets, even use one object to represent another (a washcloth may become a blanket for a small stuffed animal). Also, children gradually develop more complex play activities, and tell each other what to do. Example: three children decide to “play doctor”. They assign roles of doctor, nurse, and patient. One child uses a Tinkertoy stick as a needle, and another gives the patient and imaginary cup of medicine.

ADAPTING PLAY

There are 3 broad types of modifications which can be made to enhance a child's participation in play situations, these include:

- Physical modifications
- Environmental modifications
- Alternative play strategies

Physical modifications- If the child has a difficult time grasping and manipulating objects, then physical modification of toys would be appropriate to help make the child successful and more independent. Examples include **stabilizing** the play material to a steady surface, such as affixing a toy house to a lap tray using C-clamps. **Enlarging** parts of toys such as buttons or cranks by using Plexiglass "buttons" or corks adheared to cranks. **Prosthetize** or add parts, to allow access for physically disabled. Foam curlers added to spoons, brushes,crayons, pencils, etc. build-up the handle to allow more students to manipulate the item and be an active participant in the activity. See Table 4-1 for more adaptations.

Modifying the environment-Toys need to be readily accessible for physically disabled children to reach independently or with minimal assistance. Non-skid matting placed under toys may be all that is needed to allow a child more independent use of toys. Use of bright colors for visually impaired children, and adding symbol support for activities will help include more children in play routines.

Alternative play strategies- Modifying the rules of a game, including voice output devices to allow nonverbal children to "control" a game, and use of fewer game pieces to simplify table games are some examples. Linda Burkhart developed the concept of "talking switches" (1993) in which motorically disabled children can participate, communicatively, in a variety of activities which they normally would not be able to participate in. For example, consider playing games such as "Duck, duck, goose," "Mother May I?," "Red Light, Green Light," and "Hide and Seek," with nonverbal switch user(s) controlling the game! Simple voice output devices such as the BIGmack (Ablenet) and remote switch devices such as the CheapTalk 4 with remote switches (Enabling Devices), SpeakEasy (Ablenet), and the Switchmate 4 (TASH) would meet this need.

Table 4-1. Strategies For Adapting Play Materials*

Strategy	Description	**Example**
Stabilize	Attach play material to steady surface	Affix playhouse to lap tray with c-clamp
Enlarge	Enlarge materials to enhance visual perception Enlarge key parts to enhance toy manipulation	Use large puzzle pieces Affix large Plexiglas "button" over small Push 'n Go Button
Prosthetize	Affix parts to allow access for physically disabled	Use foam hair curlers (minus tubes) to add grip to brush handle
Reduce Required Response	Minimize: distance range of motion complexity of response	Place doll on elevated tray Use tray to keep cars within range Use plate switch rather than on-off
Make More Familiar	Relate to environment	Select symbols that reflect child's world
Make More Concrete	Reduce abstract quality	Demonstrate activity, toy play; add cues to graphic symbols
Remove Extraneous Cues	Consider goal and remove unrelated cues	If the task is shape recognition, do not simultaneously color-code items to be sorted
Remove Distracting Stimuli	Simplify "busy" backgrounds	Use dark background behind objects being visually tracked, or as a backdrop for puzzles
Add or Enhance Cues	Increase visual stimuli	Use bright, contrasting colors Affix fabrics to adaptive switches

Improve Safety and Durability	Avoid sharp objects Protect objects from drool Increase strength of toys	Round off or pad corners Laminate, add nontoxic sealant Replace cardboard with triwall. Replace staples or nails with screws

*Reprinted with permission from C. Musselwhite (1986)

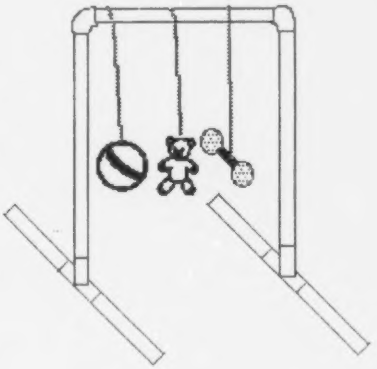
LOW AND HIGH TECHNOLOGY PLAY ADAPTATIONS

As with the other areas of assistive technology (AAC and computers), play adaptations can also be categorized by low and high tech modifications.

Low tech modifications would include:

- prosthetic materials
- activity frames
- adjustable easels
- grasping aids
- playboards
- play sets

Prosthetic Materials- Adding knobs or built-up handles may be the only adaptation needed for a child to be able to play with a commercially available toy. Items such as knobs, corks, and foam curlers are simple adaptations.

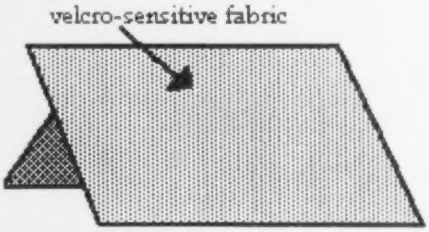


Activity Frames

Activity frames are plastic frames shaped like an upside-down "U," from which toys can be hung. They are similar to the "Baby Gyms" that are availale for infants. Activity frames can permit children with severe motor impairment to access toys that would otherwise be out of their range, or would be dropped. They may be placed on the floor, attached to a table, or attached to another piece of equipment, such as a wheelchair laptray or stander. Floor-based and wheelchair-based frames can be made out of 1/2" CPVC (plumbing pipe).

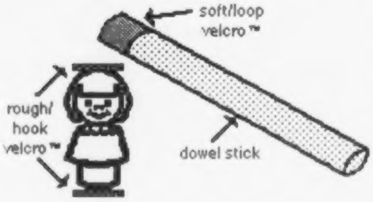
Adjustable Easels

Easels made from pegboard in which various sets of toys can be attached with string or elastic and placed on hooks would give the physically disabled child the ability to play with the same toys as typical peers without the frustration of the toys falling to the floor (Goossens' ,1989). Also, easels made with



velcro-sensitive fabric could then hold lightweight toys which have a piece of male velcro adhered.

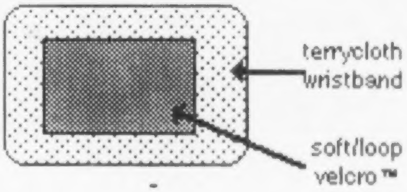
Grasping Aids - A variety of aids can be made to help children who have difficulty grasping play items, including:

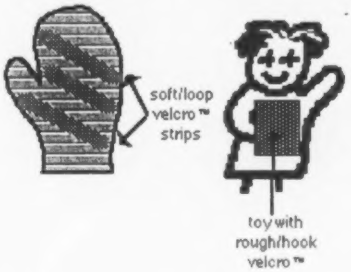


A **dowel stick holder** is a piece of dowel which has a strip of sticky-back soft (female) velcro wrapped around one end. Small toys such as people and cars can then have a piece of rough (male) velcro adhered so the child can pick them up and move them easier.

A **flat craft stick holder** with a strip of sticky-backed magnetic tape can be used for the same pursose, however, velcro adheres more readily to the varying shapes of toys than the magnetic strip.

A **palm holder** or wristband is a piece of terrycloth or a terrycloth ponytail holder placed around the child's palm with a piece of soft velcro attached. The child can then pick up toys which have rough (male) velcro attached.





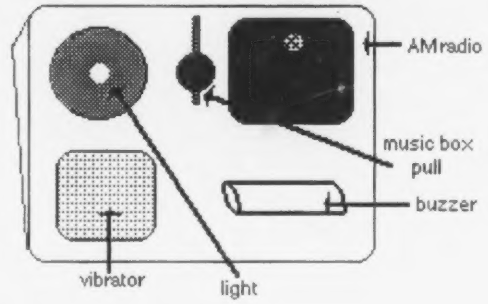
A **velcro mitt** is a mitten with soft (female) velcro attached which, when worn over the child's hand, can pick up toys which have rough (male) velcro attached.

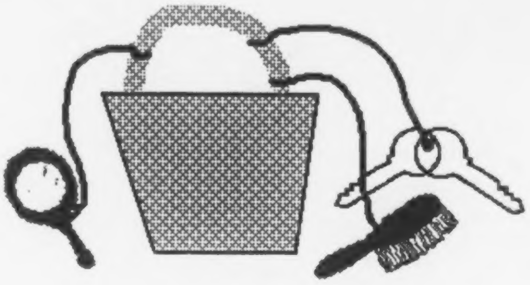
Playboards

A playboard is a way to attach toys to a surface so that they are both visible and available. Various surfaces can be used, including triwall (3-layer cardboard), foam core art board, indoor-outdoor carpet, and pegboard. Play pieces are affixed by velcro, elastic, or shoestrings. Playboards can be placed on the floor, attached to a table, and mounted on a child's wheelchair laptray. Examples would include:

- a commercially available busy box activity center (Enabling Devices);

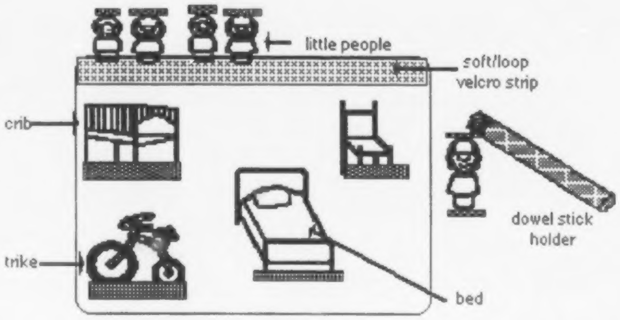
- a piece of triwall with a small baby doll, washcloth, cup, plate, and spoon attached.
- a purse with items such as keys, brush and mirror attached with elastic.


AMradio
music box pull
buzzer
vibrator
light



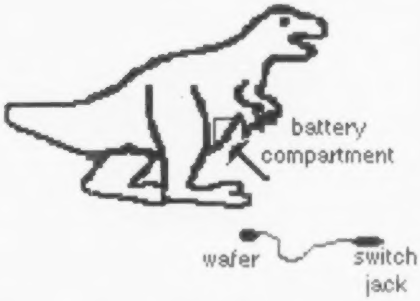
Play Sets

Play sets include several of the previous options on one piece of triwall or foam core art board. Small toys (such as playhouse pieces) are adheared to a piece of art board using velcro. A strip of soft (female) velcro is put across the top or bottom of the board to adhere people to. The child can use a dowel stick holder to then move the people around in the "house." The playset can be changed to accommodate other activities (e.g. car set).


little people
soft/loop velcro strip
crib
dowel stick holder
trike
bed

High tech modifications would include:

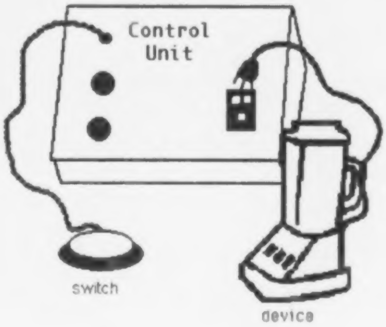
- battery adaptation
- electrical control unit


battery compartment
wafer
switch jack

Battery Adaptation

Battery operated toys can be purchased which have already been adapted for switch use. Enabling Devices, Ablenet, and Crestwood are companies which sell permanently adapted toys. If you want to further expand the types of battery toys you have in your classroom, you can use a battery adaptor to interrupt the circuit and allow most battery toys to be activated using a switch. A battery adaptor is a piece of cord which has a copper disc at one end and a jack for a switch on the other (available from Ablenet). The disc is slipped in between the battery and it's connection in the battery compartment and a switch is attached to the other end. The toy needs to be in the "on" position before the toys will work with the switch. Battery operated fans and scissors are other items which can be adapted and used to promote peer interaction if the peer holds the object and the switch user controls the "on" and "off."

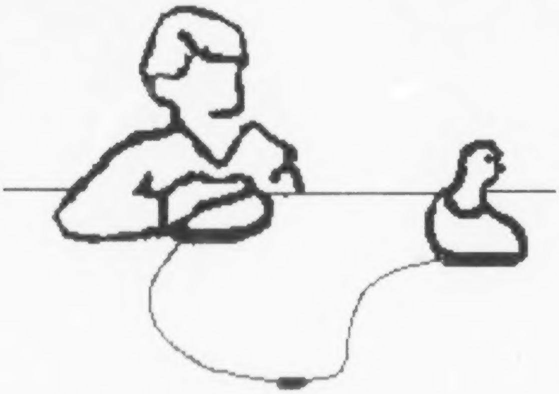
Electrical Control Unit



An electrical control unit, such as the Powerlink 2 by Ablenet, is plugged into an electrical outlet and then a switch and an electrical toy or appliance is plugged into the unit. The user then has control over items starting and stopping, such as a food processor or blender. In a early childhood classroom, this would allow a switch user to particpate in cooking activities. Toys such as a "Light Bright" could also be connected and the switch user would control how long the light is on.

MAKING BATTERY OPERATED TOYS MOTIVATING

Switch training is frequently taught through the use of battery operated toys. The child learns the cause and effect response that when the switch is depressed, the toy works, and when the switch is released, the toy stops (depending on the switch used). However, after a few times with the same toys and the same actions, the children and the adults become bored! There needs to be a way for the toy to be used thoughout the early childhood day to promote communication, interaction and turn-taking. Consider the following example:



During a large group time, a Sesame Street Bumper Car which is adapted with a battery adaptor, is placed in a hula-hoop in the middle of the group. The toy has a "bump and go" motion which means that when it touches something it changes direction. The child operating the toy will hold down the switch until the toy reaches a member of the group. This activity allows the switch user to identify the person who will have the next turn, such as to be a helper or to choose a song.

A toy which has a linear motion, moves in a straight line, could be used to carry items to another child, or to the switch user. Examples would include putting food or drink on the toy and the user has to make the toy move to him/herself to get the item. Another use would be to have other toys available which relate to the switch toy and peers can help in the play sequence. For example, items needed to feed a doll can be lined up, the switch user makes a crawling doll move to an item she wants and then releases the switch. The play partner does the action required, then replaces the item and waits for the next.

Choicemaking can also be enhanced using linear toys such as the fireman who climbs a ladder (Enabling Devices). Object, picture or symbol representation is adhered to the side of the ladder and the switch user stops the fireman at the desired choice.

Adaptive Materials

The following items for adapting toys should be available in early childhood classrooms that serve children who have special needs.

- elastic
- sticky-back velcro
- sticky-back magnetic tape
- foam curlers
- foam core art board or triwall
- dowel sticks
- ponytail holders
- corks (for building up handles or knobs)
- battery adaptors (AA and D sizes)

CASE STUDY (Continued from Chapter 3)

The feature match case study was an example of a child who required practice using a switch for access. The following is a continuation of her case with a discussion of how to use switch toys and the computer for training switch skills.

Training Methods

Parallel instruction in augmentative communication symbol use and foot controlled switch operation for scanning is recommended for Jackie.

Jackie understands how to use eye gaze for making choices. During the evaluation, she also used eye gaze to symbols on a frame for commenting and requesting. It is important that she be able to express a range of communicative intent. Therefore, eye gaze displays for activities in which she participates should be developed and used in order for her to learn independent and spontaneous communication through symbols without added demands of motor control.

In preparation for device use, Jackie has had access to switch adapted battery toys. Due to this success, Jackie is currently able to activate a single switch to speak a single message. This would allow her to access a device through remote switches or through step scanning. Single message training should be used in order for Jackie to learn when it is appropriate to activate the switch. This is a critical skill, referred to as "timed activation." This practice should occur within the context of classroom activities.

Step scanning provides access to a series of messages, one at a time. Using this method, Jackie can activate the switch to read a story or give instructions for an activity. Each switch activation results in activation of the next message. This method should also be used during classroom activities, to provide opportunities for successful switch use.

In order to work on skills she needs for automatic scanning, it is recommended that Jackie continue using battery toys, but expand their function. Toys which move in a straight line (vertically or horizontally) should be used to provide additional practice for motor planning to activate a scanning device. When a latching device is attached to the toy, one switch activation starts the toy and a second activation stops it. In this manner, choices for an activity can be laid out and Jackie instructed to use the toy to "go get" a particular item. An eye gaze frame with options for comments and requests during this activity is recommended. This type of activity can be done in a small group, where all students take turns with the switch and model activation to make choices.

Jackie will also require practice on a communication device with automatic scanning. This will be a difficult task and should be conducted in a quiet place, free of distractions, at a time when Jackie is relaxed and alert. Activities selected should be extremely motivating. Jackie should be instructed to watch the lights and listen to the auditory cues until it gets to the one she wants. Activation of a desired message should result in some type of interaction or manipulation with partners or toys.

Recommendations

1) The following equipment items meet acceptable standards for AAC intervention and are the most appropriate, least expensive solution able to completely address Jackie's needs and system features requirements as identified in this report:

   - Eye gaze frame with color coded picture communication symbols displays for activities in which she participates
   - Macaw 3+ communication device
   - Light touch switch positioned at her left foot
   - Customized mount to position switch
   - Switch latch timer
   - Battery operated toys.

2) Jackie should use a Macaw 3+ to supplement her existing language abilities. Customized Macaw displays should be developed which would be specific to the various activities which Jackie may participate (i.e., book reading, art, cooking, etc.) to give her maximum opportunities to communicate during such activities. The Macaw should be mounted to her wheelchair using a Macaw Mini Mount.

3) Jackie should access the device using a light touch switch positioned at her left foot. A permanent customized mount for the switch should be designed.

4) Jackie should participate in a variety of switch and scanning activities as described in the previous section of this report (Discussion/ Training Methods). She should use the Macaw as well as battery operated toys with a switch latch device.

5) An eye gaze frame for display of symbols should be designed (see attached instruction sheets). Multiple displays should be created which would provide access to activity-specific vocabulary. These displays may be used in isolation or in combination with switch activities and/or device use.

6) Jackie should use the same switch and mount to access the computer. To do this requires the use of an interface device which could be one of the following: switch interface box, IntelliKeys, or Ke:nx. She will need appropriate software that can be accesssed by a single switch activation for one of the following options: open apple, command, return, space or mouse click. Some programs also have specific scanning options. Appropriate software choices can include:

- Living Books programs: Just Grandma & Me, Little Monster Goes to School
- Edmark programs: Bailey's Bookhouse, Thinkin' Things, Stanley's Sticker Stories
- Active Imagination: The Yukadoos
- Apple II series public domain switch software: Cause Effect, New Cause Effect, Scanning with Academics, Snakes and Ladders, Story Talker

Goals

1) Jackie will demonstrate understanding of simple timed activation of a single message using the Macaw or a BIGmack during classroom activities (e.g., reading the repeated line of a story, singing part of a song).

2) Jackie will use the Macaw to participate in daily classroom activities using step scanning (reading a story, giving instructions, greeting children, etc).

3) Jackie will independently eye gaze to appropriate symbols to participate in activities at school and at home. (Such as asking for items to complete a task, commenting on the task, directing others, etc.)

4) During specific activities, Jackie will activate a switch to make a choice from four items (either using the Macaw or a battery operated toy).

5) Jackie will respond to visual and/or auditory feedback to self-correct errors 70% of the time.

V.

COMPUTERS IN EARLY CHILDHOOD CLASSROOMS

COMPUTERS IN EARLY CHILDHOOD CLASSROOMS

In the current age of expanding technology, computers are used for a variety of reasons, with the end goal of effective communication in a multimedia society. Computers are used daily by many adults to pay bills, balance accounts, write letters, etc. They are used in the workplace to run complex machinery and tabulate inventory. Computer skills have become a prerequisite for many jobs, and therefore have been included in most high school curricula. In addition, it is not uncommon to see computers in elementary schools, as the value of early computer skills is demonstrated in the beautiful reports with multimedia dimensions that are being produced by children in the second grade. Parents can even buy keyboards and software designed for toddlers. We seem to be giving the message to our students, "Everyone needs to learn to use a computer, the younger the better."

Although most people would agree with the need for children to learn computer skills, their educational and developmental suitability for preschoolers may not be as readily apparent. However, computers offer a variety of learning opportunities that are motivating to young children. Appropriate programs may provide:

- excellent graphics
- interesting sound effects
- music
- speech output
- interesting responses to student actions
- endless repetition
- delightful and sometimes unexpected animations
- active rather than passive learning
- opportunities for turn-taking and working in pairs

COMPUTER USE AND YOUNG CHILDREN

When determining the best use of the computer for your school program, consider the developmental stages of the children in your class. Cassatt-James (1992) reviewed research and articles on computer use among typically developing preschoolers. They learned the following:

- Three year old children enjoy watching responses when they press a key. They are most successful with programs which do not require multiple steps to get responses. They can learn to push single keys, load disks with teacher supervision and turn the computer on and off.
- Four year old children learn to follow directions from picture menus, change disks, and work with peers (take turns and work cooperatively).

- Five year old children are able to operate programs which require two or more motor sequences. They are able to effectively use the mouse to drag, click and double-click. They are learning to identify words and are motivated by programs which use the entire keyboard.

Educational areas that can be addressed through use of the computer include:

- **communication** (especially computers with speech output)
- **perceptual** (visual tracking, visual memory, figure-ground perception)
- **social interactional** (turn-taking, sharing)
- **fine motor** (accessing the keyboard, switches, joystick or mouse)
- **recreation** (independent or group play)
- **cognitive** (language concepts, sequencing, literacy)
- **mobility** (learning to use a joystick to access both computer and wheelchair)

USING COMPUTERS DURING CLASSROOM ACTIVITIES

Do not expect your software to stand alone. Enhance computer experiences with the following suggestions:

- **Props:** Use real toys, puppets, colorforms, etc. whenever possible
- **Communication Symbols:** Both generic (e.g., up, down, print, return, trash it) and software specific symbols (e.g., song choices, colors, words) can be used to allow students to comment, interact and make choices.
- **Songs:** Add songs while waiting for the computer to perform functions (e.g., warming up, changing programs, printing) or while the program is running (to support the images on the screen).
- **Sign language:** Signing can be used for both receptive and expressive language support. The teacher may use signs to visually support language (especially concepts that are action-oriented, abstract, or spacially-oriented). She may also encourage communication and interaction through sign for students who have communication delays or impairments.

COMPUTERS AND LITERACY

A number of authors have addressed early literacy and computers (Cassatt-James, 1992; Musselwhite & King-DeBaun, 1996; Steelman, Pierce & Koppenhaver, 1993; Cutting, 1989; Koppenhaver & Yoder, 1993). The following issues are relevant to computer use:

- Early literacy begins long before children learn to write their names (e.g., scribbling, looking at picture books, identifying logos of fast food restaurants).

- Key factors in learning to read include parental expectations, attention to meaning rather than form, opportunities for practice, being surrounded by reading and readers, motivation, success in literacy activities and a variety of materials.

- Many children with severe physical disabilities have limited environmental experiences and fewer opportunities to be exposed to print.

- Children benefit greatly from listening to stories at least one hour per day.

- Children learn most when they are actively involved in the storyreading experience.

- Children with certain motor impairments may not have sufficient fine motor skills to complete handwriting or drawing/painting tasks.

- It is important that children with severe communication impairments learn to spell in order to compose novel messages on communication devices.

- Children with disabilities may require more repetition than their same-age peers to learn a skill. Computers are infinitely patient.

- Some students require a multisensory approach to learning. Computers can provide tactile, auditory and visual feedback.

A number of programs are available to address literacy. Be sure to explore options and consider programs which will offer a variety of literacy opportunities:

- Exploring the keyboard and learning letters (e.g., Bailey's Book House, IntelliTalk)
- Listening to stories (e.g., Storytime Stories, Living Books, Story Talker)
- Writing stories given choices (e.g., Bailey's Book House, The Tree House)
- Writing stories with symbols or pictures (Kid Works 2, IntelliPics)
- Writing journals (e.g., IntelliTalk, word processors)
- Drawing and artistic creations (e.g., Kid Pix, Kid Works 2)
- Songs with print support (e.g., IntelliPics, Storytime Songs)

COMPUTER TERMINOLOGY

CPU (Central Processing Unit) - This is the "brains" of your computer. It is located on an integrated circuit chip inside the computer and controls all of the computer's operations. The processor also determines the speed your computer works. This is not upgradable. If your computer takes a long time to load and run programs, you probably have a slow processor. If this becomes a problem, don't spend a lot of money upgrading memory; buy a new computer.

Input devices - An input device sends information from the user to the computer. The keyboard and mouse are standard input devices. Other input devices for special needs students are described in the "Computer Access" section of this chapter.

MB (MegaBytes) - This is used as a measure of memory storage, indicating 1 million bytes. The Apple IIe, introduced in 1983, had 64K (64,000) of memory. Today, you can get a Macintosh with 16 MB of RAM.

Output devices - An output device sends information from the computer to the user. Included are monitors, sound (both music and built-in speech synthesizers) and printers.

Peripherals - Peripherals are typically items which are not necessary for the operation of the computer. Peripherals may include printers, scanners, computer video cameras, and speech synthesizers.

RAM (Random Access Memory) - This type of memory is not permanent. The amount of RAM determines the size and number of programs that can run on your computer. It is recommend that you use at least 8 MB of RAM when running *Boardmaker* and some of the multimedia programs. You can upgrade RAM. Some programs will also allow you to use virtual memory to fool your computer into accessing more RAM.

Speech Synthesizers - Speech synthesizers are used by the computer to "talk" text that is written on the computer. You will hear this referred to as "text to speech." The voice quality varies, depending on the synthesizer, though even the best voices still sound a little robotic.

Storage - Information can be stored on the hard drive of your computer, on floppy disks (3.5 inch or 5.25 inch), or on CD-ROM. Computers come with different sizes of hard drives. Usually the hard drive space can be enlarged by adding a memory expansion card to the inside of the computer, though there will be a limit to the number of cards you can add. Floppy disks store information and are read by the disk drive of your computer. Be careful not to place floppy disks near the telephone or magnets in order to avoid erasing the contents. A CD-ROM (compact disc read only memory) can store much more memory, but you cannot change or add information held on it.

TYPES OF COMPUTERS

Apple II series - Apple II series computers are no longer being manufactured. Therefore, you may find them in storage or unused in the computer resource room at your school. This is typically your least expensive option for a computer in the classroom. If you need cause-effect software (especially for single switch), this series is the best bet. An Apple IIgs is recommended over the Apple IIe or Apple+ computers. The Apple IIgs has a keyboard which is not connected to the CPU (like Macintosh and PCs). This makes it possible to easily angle or adjust the height of the keyboard according to the students' needs. The following components are also recommended:

- color monitor
- speech output (Echo speech synthesizer)
- hard disk (if available)
- two disk drives (making copying much easier)

Macintosh - When Apple came out with the Macintosh LC computer, it became possible for teachers to run Apple II series software with the installation of the Apple IIe emulator card and an Echo speech synthesizer for Macintosh. This speech synthesizer is only needed when running Apple IIe software, as Macintosh comes with its own speech synthesizer for Mac programs. The Macintosh has advantages over Apple II series and IBM in that authoring programs are very user friendly. They also currently have the most options for adapted access. The following components are recommended for your Macintosh:

- large screen color monitor
- large hard drive (at least 500MB)
- at least 8 MB, preferably 12 MB, of RAM
- CD-ROM
- external speakers

IBM Compatible Series (sometimes referred to as PCs, including MS-DOS and Windows versions) - Software for IBM and compatible computers appropriate for young children is relatively new. With the advent of CD-ROM and complete multi-media systems, programs are being designed practically every day. If you have an older model IBM or compatible, you will need to install a sound card (such as Sound Blaster) in order to have sound or speech output. Newer models (such as the Pentium series) are designed for multi-media applications and come with sound and video capabilities installed. The following components are recommended for IBM compatible series:

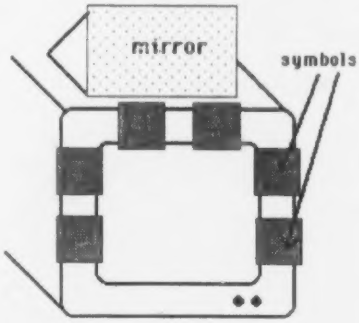
- color monitor
- large hard drive
- minimum of 16 MB of RAM, 32 MB recommended
- multi-media system or Sound Blaster and speakers
- CD-ROM
- touch screen

COMPUTER ACCESS

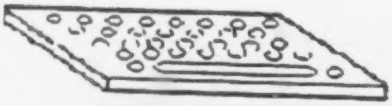
Having access to computers in the classroom has been a major determinant for successful inclusion of students with disabilities in regular education classrooms. Students who were unable to complete pencil and paper tasks may be able to produce written work on the computer. Some students are able to use the computer without adaptations, while others may require modifications to hardware and/or software.

Just as concrete ramps allow people in wheelchairs to go from a parking lot to a sidewalk, "curb cuts" can be found for the computer to permit all students to enjoy the fun and interactive learning opportunities available. These modifications can be either light tech (inexpensive, home-made tools) or high tech (sometimes called "computer inputs" or "computer peripherals").

Light Tech Tools

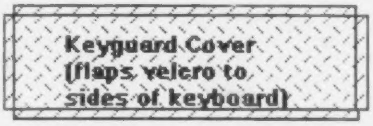


Symbols for choicemaking - Using symbols for choicemaking can offer students tremendous independence. Once the student has indicated his or her choice, a peer, teacher assistant or other helper can assist him or her in using the keyboard, mouse, or other tool to make the choice. This is a great step, while you are trying to find the best input method, looking for funds to purchases needed input devices, or helping children to use new peripherals. Symbols can be hand-drawn, copied from a symbol book, created using a symbol program such as *Boardmaker™* (Mayer Johnson Co.) or created using draw programs on your computer. You can present the symbols on a choice board or place the symbols around the computer screen. (Instructions for constructing choice boards can be found in Appendix A). If the child cannot point to the symbols, you might want to place a mirror on top of the computer monitor, so you can see where the child is eyepointing.

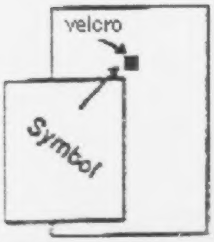


Keyguards - Plastic keyguards have finger-sized holes and can be velcroed onto the standard computer keyboard (IBM, Macintosh, and Apple II series) or expanded keyboards. They provide a platform for a student to rest his or her hand while one finger pushes a key through the hole.

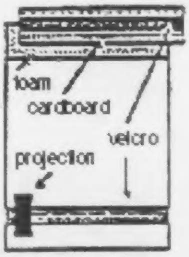
Keyboard Covers - Paper keyguards can be constructed to cover up the keyboard, with only one or two keys exposed. These can be made from poster board or construction paper, covered with contact paper on both sides, with hole cut out so that the student sees only the target keys.



Keyguard Cover Installed
(Open Apple Key
Exposed)



Flap Switch: Top View



Flap Switch: Bottom View

Computer "**Flap Switches**"- A variety of programs are available that permit page turning or other action with a single keystroke. A homemade "flap switch" can be affixed to the keyboard using velcro. The student pushes down on the flap switch and a projection, such as a piece of gluestick, depresses only the target key. Instructions for making flap switches can be found in Appendix A.

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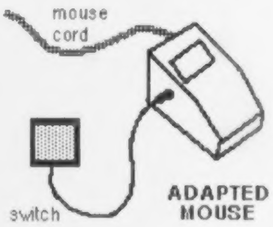
Mouse Pusher Notebook - Linda J. Burkhart has developed a simple, creative way to help students activate the mouse. A 3-ring binder with a hard cover is used. The mouse is secured inside the notebook (ex: place the mouse in the plastic pocket on the inside cover of the notebook). Then a small piece of gluestick from a hot glue gun is attached to the opposite cover, also on the inside. Now when the child presses on the top of the notebook, the gluestick is pushed down, "clicking" the mouse. This works well with programs that rely on mouse click, rather than mouse movement. An example is *Thinkin' Things* for Macintosh (Edmark), which has a single switch setup. The cursor moves automatically, and the student only has to press the mouse pusher notebook to "click" the mouse.

Switch Adapted Mouse - Your mouse can be adapted by a handy technician or purchased from RJ Cooper for Macintosh or PCs. One person (preferably a peer) moves the mouse to place the cursor and the switch user presses the switch to “click” the mouse. The click button on the mouse is disabled when the switch is plugged in, requiring the two people to work together to operate the mouse.



High Tech Tools

A number of modifications to make computers easier to use have been developed by several companies. You might hear these called “computer peripherals” or “computer hardware.” The following brief descriptions were adapted with permission from Emergent Literacy Success: Merging Technology and Whole Language for Students with Disabilities (Musselwhite & King-DeBaun, 1996).

ADAPTIVE FIRMWARE CARD
(Apple II Series - Don Johnston)
Description: This keyboard and mouse emulator allows people with a range of disabilities to run off the shelf software with Apple IIe or IIgs computers. Software that comes with the AFC permits interventionists to develop "setups" for selected programs, to make access easier for students with a wide range of needs.
Access Method: Input methods possible include

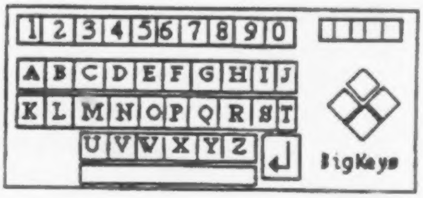
1) Alternate keyboards (expanded keyboards such as Key Largo, the Unicorn, TASH Mini or King Keyboards)
2) On-screen Scanning (using a standard switch with regular, step or inverse scanning modes)
3) Assisted Keyboard (permits single finger users to use functions such as Shift and Control by pressing a sequence of keys, adds speech to standard computer keyboard keys, etc.)
4) Morse Code (using one to three standard switches)
5) Multiple Switch Box (described below)
6) ASCII (using electronic communication devices such as Delta Talker or Liberator).

Related Software: The following quick set-up programs are available for the AFC:

1) *AFC Literacy Setups* (Don Johnson) to support use of scanning, Touch Window, Match Box, and Unicorn keyboards; and
2) *AFC Emergent Literacy Fun* (Creative Communicating) to support use of the Multiple Switch Box.

BIG KEYS KEYBOARD

(Macintosh, Windows PC -- Don Johnston, Inc.)



Description: This alternate keyboard offers large, 1-inch keys with spacebar and return keys that are even larger. Letter keys are presented in alphabetical order with bright colors. Number keys are in a separate row, presented in correct left-to-right order. Function keys (tab, command) are provided as a row of grey keys, and arrow keys are arranged in a diamond, using "natural branching". (UP is at top, RIGHT is on right). The keyboard attaches through the standard keyboard port. This keyboard is intended for students with a range of needs, including cognitive delays, learning disabilities, and physical disabilities.

Access Method: This keyboard uses a clear, tactile downward press and release of the computer keys

Related Software: This keyboard emulates a standard keyboard, meaning that it works with all regular software.

CLICKIT! (Macintosh -- IntelliTools)

Description: *ClickIt!* software allows the user to point and click without a mouse. It is a program that permits interventionists to customize scanning and overlay access for Macintosh software. With ClickIt!, "hot spots" can be chosen for places where the user needs to point and click. The hot spots can then be highlighted, auditory feedback can be added, and an action can be provided.

Access Method: Several options are available, including

1) IntelliKeys
2) Standard keyboard (using the space bar click the mouse when scanning)
3) Switches (up to three switches at a time)
4) Mouse click (on screen scanning, with mouse click activation)
5) Alternate keyboards (Key Largo, TASH Mini or King)

Related Software: *ClickIt!* is software, so no additional software is required.

INTELLIKEYS

(Apple II, IIgs, Macintosh, IBM -- IntelliTools)

Description: This peripheral functions as a "smart" keyboard that sends information directly to the computer. The same keyboard is used for all computers, with a different cable for IBM versus Apple IIgs/Macintosh computers. A special interface card is

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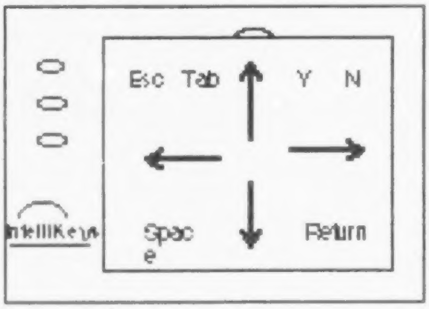
required for Apple IIe. This membrane keyboard has an active area of 7+" tall by 12" wide, with 576 individual key cells.



Access: Access is achieved through pressing directly
on the keyboard or via activation of one of two switches.
Several keyguards are available.

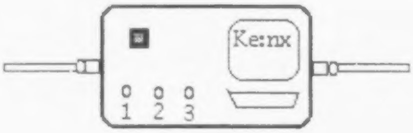
Related Software:

1) Instant Access sets for Living Books (Broderbund)
2) Instant Access sets for Edmark software
3) *Overlay Maker* - used to develop customized overlays
4) *IntelliTalk* - talking word processor (When you create overlays for IntelliKeys using *Overlay Maker* , a child can press words or pictures on the keyboard, see print on the screen, and hear the words spoken through *IntelliTalk*).
5) *Activity Exchange* – Activities can be downloaded from http://www.intellitools.com

KE:NX/Discover

(Macintosh -- Don Johnston, Inc.)

Description: Ke:nx is a Macintosh interface that offers numerous access options. It is a hardware and software combination. It allows many types of alternative input devices to "talk" to the computer. Ke:nx can be combined with a wide range of icon galleries that can be used to develop setups (e.g., Blissymbols, *Boardmaker*, DynaSyms, Imaginart symbol galleries).



Access:

1) Alternate Keyboards (Key Largo, TASH Mini and King)- squares or groups of squares act like keys, mouse commands or voices. Key Largo is a 16" x 12" x 3" ergonomically designed expanded membrane keyboard for the Macintosh. Users who need only alternate keyboard access can purchase Discover:Board separately from Ke:nx. It can be used with any application programs, emulating keyboard or mouse entry. A design program permits customization of Discover:Board files.
2) On-Screen Keyboard - Talking icons or letters can be displayed on the computerscreen, with the user pointing to and clicking on the items using a mouse, joystick, touch screen or other mouse pointing device. Users may purchase just the on-screen option without the entire Ke:nx program, called Discover:Screen. Talking files support multisensory learning and customization of Discover:Screen files can be achieved through a design program.
3) Assisted Keyboard - The standard keyboard can be modified to include talking capabilities, strings of commands, and mouse functions.

4) ASCII Input - allows access using a communication device (e.g., DynaVox, Liberator, DeltaTalker, AlphaTalker) as the keyboard of the computer.
5) On-Screen Scanning - displays a window of items for text entry, mouse movements or communication phrases. A switch press is used to select an item. For users who need only scanning access, the Discover:Switch can be purchased separately from Ke:nx. Choices are automatically highlighted and users press the Discover:Switch to activate. Auditory scanning is also available. On-screen keyboards can be created to function as communication displays. More than 500 graphics are included in a graphic library and a design program permits customization of Discover:Switch files. The Discover:Switch can be used with any application programs, emulating keyboard or mouse entry.
6) Morse Code - the user can decide what the dits and dashes will mean.

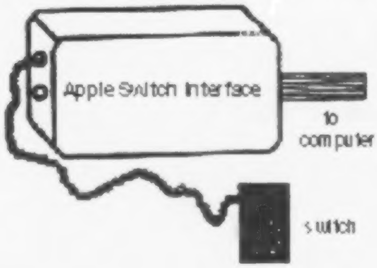
Related Software:

1) Easy Overlays - ready made setups for use with Key Largo, Discover:Board
2) Easy Scans - for use with a single switch
3) Easy Screens - for use with Touch Window or other mouse device
4) Curriculum Overlays - provides ready-made supplemental classroom learning materials for Key Largo or Discover:Board.
5) Fast & Go Key Largo - a variety of ready-made setups.

SWITCH INTERFACES

(Apple II series, Macintosh, IBM/PC -- AbleNet, Don Johnston, Inc.)

Description: A variety of switch interfaces are available to permit access to single switch software. Samples include:



1) Macintosh Switch Interface (Don Johnston, Inc.) - plugs into ADB connector on Macintosh keyboard. Works with any software that uses mouse "click."

2) DJ PC Switch Interface (Don Johnston, Inc.) - permits four different configurations, moving between setups on DOS or Windows computer by pressing a function key. Plugs into any unused serial port on the computer.

3) PC Switch Interface (AbleNet) - connects to one of four switches to operate software designed for switch control, with each switch controlling a different keyboard function. Uses a 25-pin interface, with a nine-pin interface sold separately.
4) Apple Computer Switch Interface (AbleNet) - connects through external joystick port (nine-pin connector) for Apple IIe or IIgs models, with an I/O port adapter required for Apple II+ models.

Access: single or double switch access, with features such as timing and type of scan determined by the software that is being accessed.

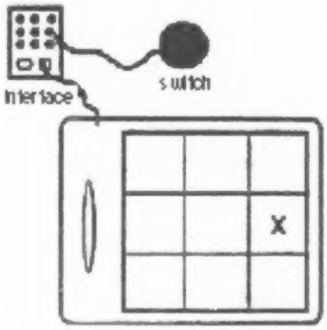
Related Software: Look for switch-ready software (e.g., *Story Talker* - public domain, *Storytime Stories* - Creative Communicating) or programs for Apple which are activated by Open Apple or Closed Apple/ Option keys.

SWITCH POWERPAD

(Apple II series -- Creative Communicating)

Description: This membrane keyboard has a 12" x 12" active surface and is plugged into the game I/O port on the Apple II series computer. The Switch PowerPad is a modification of the standard PowerPad to permit input using up to nine single switches. A switch is plugged into the jack matching the desired location on the PowerPad overlay.

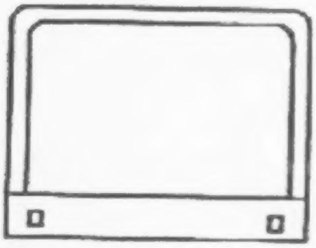
Access: Direct selection on the PowerPad or remote switch activation of up to nine switches.



Power Pad

Related Software:

1) Many custom software programs are available from Creative Communicating and UCLA (e.g., *Storytime Songs, Buddy's Body, Old MacDonald's Farm*)
2) *Talking Power Pad* (Public Domain) - can be used to crease a talking overlay of up to 36 message cells. Text appears on the monitor.
3) Power Key Program (Dunamis) - enables the Power Pad to operate as an expanded keyboard and work in conjunction with the Adaptive Firmware Card to create writing setups.
4) Adaptive Firmware Card - Use the Adaptive Firmware Card Setup disk or the Talking Word Board disk to create overlays that can be used with word processing programs.



Touch Window

TOUCH WINDOW (Apple II, Macintosh, DOS/Windows -- Don Johnston, Edmark)

Description: This alternative input peripheral works just like a mouse for the Macintosh and most PCs. The Touch Window can be placed directly over the computer screen and used to access the computer. The mouse functions of clicking and double-clicking can be carried out by simply touching on the Touch Window surface. The Apple II version is not a mouse emulator and requires specific Touch Window software in order to run (see below).

Access: Direct selection on the sensitive surface of the Touch Window. You may need to calibrate for positioning of different students when mounting it to the edge of the monitor, as the distance between the screen and the Touch Window may cause the mouse to appear higher or lower than the spot being activated.

Related Software:

1) Edmark software for Touch Window
2) *Talking Pix* (Public Domain) - Construct your own talking picture boards. The Touch Window can be placed on a lap tray and pictures or words can be attached to the underside. Messages will be spoken via the Echo speech synthesizer.

UNICORN EXPANDED KEYBOARD

(Apple II series -- no longer sold)

Description: This touch-sensitive keyboard provides an alternative keyboard for persons who cannot use the small keys of the standard keyboard. It plugs into and runs off of the Adaptive Firmware Card. Two models are available -- the original Unicorn and the smaller Unicorn 510 (active surface is 5" x 10"), permitting use of standard paper). While these keyboards are no longer nationally marketed, many are still used in classrooms with Apple II computers. (Exchange of a Unicorn keyboard can be used for a $100 rebate when purchasing of an IntelliKeys keyboard.)

Access: Direct selection of keyboard. Keyguards are available.

Related Software:

1) Adaptive Firmware Card (Don Johnston, Inc.) -Talking Word Board disk or Adaptive Firmware Card Setup disk can be used to create overlays that can be used in conjunction with word processing programs (e.g., story-specific overlays).
2) AFC Literacy Setups (Don Johnston, Inc.) - provides setups for many common Apple II programs, with paper overlays for both the Unicorn and the Unicorn 510.

SELECTING COMPUTER SOFTWARE

Consider the following criteria when purchasing software:

- **Ease of use**: Look for programs that can be entered and used by students, with limited written instructions, limited number of keys to run.

- **Different levels**: Find programs which will allow for growth or different ability levels of children.

- **High interest** subject matter: Look for programs with graphics and sound which enhance rather than detract from the topic. Are the graphics colorful, clear, vivid? Are the sounds lifelike?

- **Independent** control: Find programs which allow children to initiate changes and actively participate and interact with the computer as well as with other children sharing the same computer. Find out if the software requires reading in order to operate. Consider programs with options for alternative access.

- **Appropriate responses**: Look for programs which assist children in learning and do not use negative sounds or words for wrong answers.

Free (or Nearly Free) Software

- **Public domain** software is not copyrighted and can be copied for free, though the number of quality programs for early childhood are limited.

- **Freeware** is similar to public domain software. It may or may not be copyrighted and is meant for your use and not necessarily to be copied for the public.

- **Shareware** offers an opportunity to try software for free before purchasing, and may cost anywhere from $5 to $75 to purchase. Below is a list of companies which carry public domain software, freeware and shareware.

Free (or Nearly Free) Software for Early Learning

➢ Colorado Easter Seals
Center for Adapted Technology
5755 W. Alameda Ave.
Lakewood, CO 80226-3500, 303-233-1666
Apple II public domain, Mac & IBM shareware

➢ Educorp
7434 Trade Street
San Diego, CA 92121
800 843-9497

➢ Innocomp http://www.sayitall.com/innocomp/icons
Free icons

➢ IntelliTools http://www.intellitools.com
55 Leveroni Court, Ste. 9
Novato, CA 94949
800-899-6687 (IBM & Mac)
Activity Exchange (Intellikeys)

➢ R. D. Wanderman
http://www.ldresources.com/software.html#Stand+Alone+Software
Free Hypercard based software

➢ R.J. Cooper and Assoc. http://www.rjcooper.com
24843 Del Prado, Ste. 283
Dana Point, CA 92629
800-RJ-COOPER (IBM & Mac)
Demos of switch software

➢ Simtech Publications http://www.hsj.com
134 East St.
Litchfield, CT 06759-3600
860-567-1173
Free Utilities for HyperSudio and HyperCard
Switch Software for Mac & Windows

- Technology for Language & Learning
  Special Education Public Domain Project
  P.O. Box 327
  East Rockaway, NY 11518-0327
  516-625-4550

More Libraries of Shareware/Freeware or Useful Utilities

➢ Apple Software Library	http://www.apple.com/education/k12/disability/shareware.html
➢ Creative Communicating	http://www.creative-comm.com
➢ IntelliTools Activity Exchange	http://www.intellitools.com
➢ Missouri Technology Center for Special Education	http://techctr.educ.umkc.edu/welcomepage
➢ Project Enable File Libraries Directory #10 - Education	http://www.icdi.wvu.edu/files/file10.htm
➢ Trace Center's Software Toolbox	http://trace.wisc.edu
➢ Virtual AT Center Mac, Windows, and DOS	http://www.at-center.com

Commercial Software

Thousands of software titles are available to support the learning of young children. Some software has been written specifically for children with disabilities, such as software that includes symbols and software that works automatically with a single switch. Many books and magazines are available with extensive software reviews. Organizations such as those listed at the end of this chapter often have software that you can preview, or even take home to try out on your computer. They may also have public domain software. This section presents only a few samples of commercial software, to give readers an idea of the enormous range of topics and learning opportunities possible.

Bailey's Book House (IBM Windows, Windows 95 CD, Macintosh - Edmark)
Both disk and CD-ROM versions of this fun software are available. Activities include: making a card, exploring the alphabet, building and listening to fun rhymes, and creating simple stories from pictures. For children who cannot use the mouse or a Touch

Window, both Don Johnston, Inc., and IntelliTools have prepared "setups" to go with their computer peripherals.

Best of KidTECH (IBM/Windows, Macintosh - Creative Communicating / KidTECH)
Single verses of several favorite children's songs are included on this disk. Samples include "I'm Bringing Home a Baby Bumblebee" and "Five Green and Speckled Frogs." Many other titles are available, such as "Monkeys Jumping on the Bed" and "Old MacDonald's Farm." Materials can also be purchased to allow use of computer peripherals such as IntelliKeys.

Blocks in Motion (Macintosh - Don Johnston, Inc.)
This creative program provides block manipulation opportunities for students with severe physical involvement. Activities include: building and knocking down blocks, making shapes, problem solving and playing with cars. It comes with adapted "setups" for single switch (using Ke:nx or Discover:Switch) or alternate keyboard (Discover: Board, or Key Largo with Ke:nx).

Boardmaker (IBM, Macintosh - Mayer Johnson, Inc.)
This handy program allows users to create communication symbols and displays using the Mayer Johnson Picture Communication Symbols. Pre-Made Grids are available for most alternate keyboards and communication devices in Version 3.2 of this software. You can search for symbols in English, Spanish, French (Canadian), German, Portuguese, Swedish, Dutch, Italian and Danish. With version 3.2, you can use the draw program provided, or copy symbols to use in other programs. Multicultural and sign language symbols can be accessed from the web site (www.mayerjohnson.com).

Clay Play (Macintosh - Linda Burkhart)
This is an *IntelliPics* program which provides children with physical disabilities the opportunity to watch what happens to the clay on the screen when they select certain actions or colors. It can be accessed with the mouse, IntelliKeys or single switches.

Hokus Pokus (IBM - Creative Communicating)
This simple cause-effect program allows a child to add to a figure or an item each time s/he presses a switch. Animation and sound effects are given as a reward when any of the 10 pictures is completed. A mouse, switch, Touch Window, or keyboard key can be used to operate the program.

IntelliPics (Macintosh - IntelliTools)
This simple program is also an authoring tool, providing graphics, simple animation, sound and text to speech. Using the provided programs, students can listen to Nursery Tales or explore what happens to animals on the screen when they select numbers, colors or actions. It is easy to modify these programs for an endless variety of subjects. A mouse, switch, keyboard or IntelliKeys can be used to run the program.

IntelliTalk (Apple II series, Macintosh, IBM - IntelliTools)
This is a simple talking word processor. As long as you have a computer that is capable of speech output, this program reads letters, words and/or sentences as they are typed. Picture menus are provided for children with drag and click mouse skills.

KidDesk (Macintosh, IBM - Edmark)
A must for any classroom! This desktop protection program provides "kid-friendly" menus and pictures for accessing software. It allows teachers or parents to hide programs which may "crash" the computer (e.g., system software) and keeps children from deleting or renaming important files.

KidPix (IBM/CD, Macintosh - Broderbund)
This program is available on disks and on CD (*KidPix 2* and *KidPix Studio*). It offers many options for drawing, creating and beginning writing. The Studio version also contains a number of video clips and allows students to place their creations in a strip to make their own video with sound effects. It can be accessed with the mouse, keyboard, or IntelliKeys.

Kid Works (IBM/Windows, Macintosh - Davidson)
This program is available on disks (*Kid Works 2*) and on CD-ROM (*Kid Works Deluxe CD).* It is a creativity program that lets children paint, write using pictures, and read their stories aloud. No modifications are included for children with disabilities.

Living Books (IBM, Macintosh - Broderbund)
These programs are available as CDs, requiring a CD-ROM player (a multi-media system) on the computer. Many titles are available, such as : "Dr. Seuss's ABC", "Just Grandma and Me", "The Tortoise and the Hare", and "Little Monster Goes to School. " Each one features lovely graphics and animation (though sometimes too "busy" for very young children or children with disabilities), speech output and highlighted text. Many fun interactions are available on each screen. For children who cannot use the mouse or a Touch Window, both Don Johnston, Inc., and IntelliTools have prepared "setups" to go with their computer peripherals (Key Largo, Discover:Switch, IntelliKeys)

Millie's Math House (IBM, Macintosh - Edmark)
This program is available both on disk and CD-ROM. In order to get sound for your IBM, however, you need a sound card or multi-media system. Fun activities work on numbers, size (big, medium and large) and building matching shapes. For children who cannot use the mouse or a Touch Window, both Don Johnston, Inc., and IntelliTools have prepared "setups" to go with their computer peripherals.

MultiMedia Nursery Rhymes (Macintosh, IBM, CD-ROM - BeachWare)
This CD-ROM presents 40 nursery rhymes in four categories: singing ("This Old Man"), Animal Rhymes ("Little Bo Peep"), People Rhymes ("Jack and Jill") and Fingerplays ("Ears Hang Low"). Each rhyme includes music, singing and animation. Students can click on characters for extra sound effects and animations.

Sammy's Science House (IBM Windows, Windows 95 CD, Macintosh - Edmark)
Both disk and CD-ROM versions of this fun software are available. Activities teach: sorting, sequencing and problem-solving. Children learn about science topics such as the weather, plants, animals and seasons. Both Don Johnston, Inc., and IntelliTools have prepared "setups" to go with their computer peripherals for children who cannot use the mouse or a Touch Window.

Story Talker (Apple II series - public domain)
This talking word processor requires the Echo II speech synthesizer. This results in very robotic speech, but the price is right. With this program, students can write a story, print a story, edit a story or read a story. Every time the student presses a single switch, a story line is read and the text appears on the screen.

Storytime Songbook (Macintosh - Creative Communicating)
This software includes five fun songs based on five stories from the first Storytime book, by Pati King-DeBaun. Highlights include: colorful graphics, animation, highlighted text, enlarged text, music and digitized singing. Many different inputs are possible, such as IntelliKeys, single switch and Touch Window.

Storytime Stories (Apple II series, Macintosh - Creative Communicating)
All of the stories from the three Storytime stories by Pati King-DeBaun are available for the PowerPad (Apple IIe and IIgs) and for single switch input (Apple IIgs only). For these programs, features include animation and computerized speech. The stories from Storytime Just for Fun are also available for use with the Macintosh and IntelliKeys. These programs feature digitized speech and fun extension activities.

The Tree House (Macintosh - Broderbund)
This exploratory program provides many options when the student clicks the mouse. Activities include: Silly Sentence Theater, Musical Keys, Musical Maze, Music Makers, Road Rally, Animal Album, Guess My Animal and Backyard Exploring. A simple modification allows you to click-move-click rather than click and drag with the mouse. No other modifications are available within the program for students with disabilities.

Wheels on the Bus (Apple II series, IBM, Macintosh - UCLA Software)
Several versions of this song are available, for various computer models, and for use with various inputs, such as IntelliKeys, Touch Window, single switch or PowerPad. Each version permits children to sing five verses by pressing the corresponding picture on an overlay or on the Touch Window.

BASICS FOR MACINTOSH USERS

- **Commands** - You can use keyboard shortcuts to speed up some functions.

  Command-s saves a program.
  Command-p prints.
  Command-q quits.
  Command-f will allow you to type the name of a program in order to "find" it.
  Control-Option-Command, then press **Escape** will force quit the program
  Control-Command, then press **Reset** to restart the computer
  Shift-Command-3 takes a picture of the screen. You will hear a click that sounds like a shutter opening and closing on a camera. An icon will show up as Picture 1 on the desktop. It can be opened by double-clicking on the icon. Then choose print from the file menu, or copy a selection to your clipboard.

- **Finder** - This is the desktop you see when you start up the computer. If you want to open more than one application program, click in the upper right hand corner and drag down to Finder. If you had an application open, you may want to select Hide Others in order to see the folders on the desktop.

- **Memory** - To find out how much memory is available on your computer, go to the Finder and open your hard drive. If View by icon is selected, you will see the amount of memory in disk and the amount of memory available at the top of the folder. You can use this same method with any folder to find out the amount of memory it uses. You can also select a folder and choose **Get Info** from the **File** menu.

- **Running Programs Simultaneously** - How do I know which programs are still running? Look for an icon in the upper right hand corner. (Some programs for children are protected and this won't be an option; you will need to quit the program first.) When you click on this icon, running programs will be listed at the bottom. Sometimes a program will show up that you thought you had quit. Drag down to that program. When you release, the menu bar will change. Type Command-q to quit that program. The computer should revert to your previous program, or use the icon in the upper right again to switch back.

- **Voice Output** - Every Macintosh comes with a speech synthesizer installed.

Macintosh- Special Needs Options

The following programs are standard control panel options for Macintosh users with special needs. If you cannot find them on your computer, they may need to be installed from the special needs folder of your hard drive or from the TidBits disk in your accessory kit (Hanser, 1995).

Mouse Keys - Allows the numeric pad to control the mouse (all directions, including at angles, 5 = mouse click). The numbers on the numeric pad will be disabled. When installed, Mouse Keys is located in the Easy Access Control Panel (under the Apple Menu). Use this control panel to adjust speed, delay and auditory feedback. A short cut to turning Mouse Keys on/off: press Command, Shift and Clear. You will hear a chime to let you know it worked. Ascending chime = turning on, descending chime = turning off.

Sticky Keys - Allows for one finger typing. With Sticky Keys on, when a modifier key is pressed once, it will continue to act in the pressed position for the next key selection. The modifier keys include: Command, Control, Shift and Option. If the modifier key is pressed twice, this locks it; press the modifier key again to unlock it. To turn Sticky Keys on, use the Easy Access Control Panel under the Apple Menu, or simply press the Shift key 5 times. A small icon will appear in the upper right hand corner of the screen. Watch what happens to the icon when you push modifier keys. To turn off Sticky Keys, press Shift key 5 times.

Slow Keys - Delays the acceptance time on the keyboard to ignore accidental keystrokes. Turn on/off and make adjustments through the Easy Access Control Panel (under the Apple Menu). A click sound can be used as feedback to let the user know the key has been activated.

Close View - Magnifies the screen. If it is not in the Special Needs folder of your Apple Accessories, you may find it on the Tidbits disk in your accessory kit. It must be installed on the Control Panel before it will work. To access Close View, open from the CloseView Control Panel. This menu will allow you to adjust magnification and whether you want the screen black on white or white on black. Keyboard shortcuts are as follows: hold down Option and Command keys, then press **O** to turn program on/off; hold down Option and Command keys, then press **X** to turn on/off magnification; hold down Option and Command keys, then press up or down arrows to adjust degree of magnification.

ACCESS FOR IBM

Windows '95 Accessibility Options

Keyboard Properties

- StickyKeys - use if you want to use Shift, Ctrl, or Alt key by pressing one key at a time
- FilterKeys - use if you want Windows to ignore brief or repeated keystrokes, or slow the repeat rate
- ToggleKeys - use if you want to hear tones when pressing Caps Lock, Num Lock or Scroll Lock

Sound

SoundSentry - use if you want Windows to generate visual warnings when your system makes a sound
Show Sounds - use if you want Windows to tell your programs to display captions for speech and sounds they make

Display

High Contrast - use if you want Windows to use colors and fonts designed for easy reading

Mouse

MouseKeys – use if you want the pointer with the numeric keypad on your board

General

Automatic Reset – turn off accessibility features after idle for (blank) minutes
Notification - Give warning message and/or make a sound when turning a feature on/off
Serial Keys Device - allows alternate access to keyboard and mouse features

Display Properties

Scalable user interface properties allow adjustment of sizes and colors of window titles, scroll boards, borders, icons, menus, and other screen elements

Mouse Properties

Customizable mouse and mouse pointer options let you adjust mouse response, size of pointer, and other aspects to increase visibility

Access DOS
Includes StickyKeys, ToggleKeys, MouseKeys, SerialKeys, ShowSounds and Keyboard Response

Available free from IBM 1-800 426-7282
Write to AccessDOS Registration
Trace Research and Development Center
S-151 Waisman Center
University of Wisconsin-Madison
Madison, WI 53705-2280

Access Pak for Windows 3.1
Includes StickyKeys, ToggleKeys, MouseKeys, SerialKeys, ShowSounds, Keyboard Response Features (SlowKeys, RepeatKeys, and BounceKeys) and TimeOut Features

Available from Microsoft 1-800-426-9400
To download a copy of this software, the URL is
http-//trace.wisc.edu/comp_access/win/access _pak.html
FTP anonymous:
FTP.Microsoft.com - retrieve file accp.exe from the /SOFTLIB/MSLFILES directory
Microsoft Site:
http://www.microsoft.com/windows/enable/

PROBLEMSOLVING THE APPLE IIe SERIES

How do I start? When running an Apple computer without a hard drive, you need to put a disk in the drive before starting your computer. Make sure the disk is completely in and the door locked (if there is one).

No picture? Check plugs and connections from the monitor. Look for an on/off button for the monitor. (If you plug all components into one surge protector, you can turn all on and off with the button on the strip.)

Screen still blank? If there is a lone cursor blinking (a line or a box), try typing RUN MENU or RUN HELLO.

No response from keyboard? Check plugs and connections. Make sure any adapted peripherals not being used are turned off. Push down CAPS LOCK key (a number of programs require it, but don□t tell you). If this doesn't work, reboot the computer.

How do I reboot (restart) the Apple computers? Hold down the Control key, Open Apple key and tap the Reset key.

No sound? Check to see if the program requires an Echo Speech Synthesizer. This involves a card which plugs into slot 4 or 5 inside the computer. The wire that comes out of the speaker plugs into the back of the computer. Check the connections and the volume on the front of the speaker.

How do I print? If you are using a program with print options (word processing, graphics or drawing programs), use command-P. If there is no print option, you can still print the screen if you have a FingerPrint Card (Thirdware). This is a circuit card which fits into one of the expansion slots inside the computer. An external square of plastic with a fingerprint on it will be visible. Push this to print the screen.

How do I quit a program? Depending on the program, you can use escape or command-q.

What if a program locks up? Press the escape button. If this doesn't work, try typing PR5 (use capital letters). It is another way to restart the computer, forcing it to look for the program again on the disk drive.

How do I know if a program works with a single switch? When the program is running, see what happens when you push the command or open apple key. If it responds, you can use a single switch. Plug the switch into the interface on the side of the computer (if you have a switch interface, SuperPort for PowerPad, or adaptive firmware card).

What if my Touch Window isn't working? The Apple Touch Window works only with programs written specifically for it. If you know the program was written for Touch Window, check the connections and restart the computer.

VI.

ASSISTIVE TECHNOLOGY AND THE EARLY CHILDHOOD CURRICULUM

ASSISTIVE TECHNOLOGY AND THE EARLY CHILDHOOD CURRICULUM

"Curriculum" as a term related to early childhood is not always as easily defined as the curriculum, for example, in fifth grade. As with older children, this term is used to help teachers define what they will be doing in their classrooms. Southwest Human Development defines curriculum as "a plan to promote children's and families' development and learning. This plan specifies: (1) individual child/family goals and objectives, (2) materials, activities, and experiences which will facilitate achievement of these goals and objectives, and (3) the role of staff and parents in helping children achieve their goals." This definition is reflective of Head Start Program Performance Standards (M. Plutro, Head Start Bureau, Washington D.C.).

Developing a Program Philosophy

The section on "Assistive Technology and the IEP" discusses methods for writing individual objectives for students who need assistive technology. In this section, the reader is challenged to think of the objectives of their program as a whole. The following questions are taken from M. Pluto, Head Start Bureau, Washington, D.C.

- How is the curriculum meaningful for these children? Is it relevant to the children's lives: Can it be made more relevant by relating it to personal and family experiences which the children have and additional ones they can easily gain through direct experience?

- How does the curriculum facilitate and support learning in an integrated and natural (sound child development) way?

- How does the curriculum utilize both the indoor and the outdoor learning environments?

- How does it foster children's explorations and inquiry rather than one, right way to do things?

- How does it promote and encourage social interaction among children and adults?

- How does it respect children's needs for activity, for sensory learning, for real experiences?

- How does it promote feelings of safety, security, and belonging? How does it provide experiences that promote success, competency, and pleasure in learning?
- How does it permit flexibility for children and adults?

Additional questions might include:

- How does this program address assistive technology needs?
- How do we include all children in classroom activities?
- Does the program support children's explorations and inquiry (reflecting the understanding that for young children the process is more important than the product)?
- How does the program provide opportunities for relevant,, meaningful and experiential learning in the context of natural environments, activities and family routines?

PLANNING THEMES

Historically, teachers have selected themes that they feel are motivating to young children, and plan activities related to the theme for the week (or month). Examples could include farm animals, seasons, bears, etc. These themes may also be based on academic "readiness", such as learning colors and letters of the alphabet. It is important to note, however, that this approach may not take into consideration the developmental levels and interests of the children in the class. A number of alternatives have been suggested for child-centered, developmentally appropriate practices. Team members should carefully examine their alternatives, and choose an approach that is comfortable for them, and meets the needs of the children in their classrooms. More than likely, a combination of approaches will be used.

Creative Curriculum

The "Creative Curriculum" emphasizes organization of the environment in order to promote learning in various interest areas: blocks, house corner, table toys, art, sand and water, library, music and movement, cooking, computer, and outdoors (Dodge & Colker, 1995). Themes begin with what children know and see every day. The authors report an incident that occurred in a school where a large construction project was taking place. When the children expressed interest, the teacher began bringing in tools and various construction props, modifying the interest areas in order to reflect the "building" theme. They also went on trips to the construction site and the library in order to gather additional information and provide opportunities to learn through different mediums.

Assistive technology would be included in the engineering plan when designing or modifying interest areas to reflect the current theme. Careful observation of children interacting in these settings would be used to brainstorm appropriate adaptations of materials and/or vocabulary displays. Teachers could begin with generic adaptations for general interaction in the area, and move to specific ideas as the theme is developed. When using augmentative communication systems or symbol overlays, the core vocabulary could remain fairly consistent, while supplemental vocabulary would change. For example, the housekeeping area typically includes a sink. Core vocabulary could include such words as "dirty", "wash", and "water." Specific vocabulary that would be added as the children explore the construction theme might include "cement", "sand" and "greasy." Modifications to the center for access might include ramps or a stander for positioning, a switch and a loop tape with water noises, and a pouring switch. Computers would be offered as a choice for interest areas when appropriate. *Blocks in Motion* (Don Johnston) could be used to provide practice in construction for all students, including those who have difficulty manipulating the blocks in the block area.

Developmental Themes

Curtis & Carter (1996) suggest that "at the heart of children's learning is active play - uninterrupted time to explore, be physically competent, and represent their experience and understandings." A developmental framework for planning activities can result in careful observation and understanding of the needs of individual children. In the book *Reflecting Children's Lives: A Handbook For Planning Child-Centered Curriculum*, teachers can find terrific suggestions for reflecting on their frame of reference when planning activities. Curtis and Carter challenge us to respond to children, anticipate children's needs and interests, introduce new ideas, facilitate exploration, and analyze and interpret children's behavior. Teacher's roles can include observer, prop manager, mediator, coach, scribe and broadcaster.

Developmental themes include: (1) play themes (including exploration, construction, pretend, games), (2) meaningful work, (3) physical development, and (4) creative expression. Teacher's decisions about classroom modifications, materials and activities are based on their knowledge of each child as well as child development in general. This classroom could be a challenge for teachers wanting to integrate students who have assistive technology needs. As with the Creative Curriculum themes, materials would be generic and initially be constantly modified as children grow and develop more in-depth understanding of items around them.

Storybook Centered Themes

Musselwhite and King-DeBaun (1997) suggest a combination of planned activities around a central story for the month and open-ended activities that provide children with opportunities to explore on their own. One important element of their program is the emphasis on enriched early literacy opportunities. For students who have significant speech impairments, development of reading and spelling skills will most likely be delayed. Therefore, carefully planned activities and opportunities to work on early literacy skills should be offered to students in a framework which allows for individual choice, creativity, exploration and expression of mastery. Students who have low verbal skills (including those who use augmentative communication) will have opportunities to use the vocabulary set from a "story for learning" in a variety of situations and experience success. According to the authors, this method "provides students with a 'comfort zone'; with familiar vocabulary appearing for multiple activities, rather than new vocabulary for each activity, as happens when using unrelated activities."

An example of a book for learning is "The Very Hungry Caterpillar". Each day, the children could read the same book, looking for different information (e.g., What happened in the story? How did the caterpillar change? What did he eat? How many days did he eat? What did he eat on certain days?). Extension activities could include eating the same items as the caterpillar each day in snack, making a cocoon and taking turns crawling through and flying away, charting the foods, constructing butterflies or caterpillars and decorating the room, etc. The storybook centered approach was designed with assistive technology in mind. However, this method has potential to be very teacher-directed. When teachers design activities around a certain theme, they need to accept that their wonderful creations may not reflect the interest of the children. In addition, sound practices of child development and child-centered learning are still important in this model. For example, children who have not demonstrated an interest in or developmental readiness for writing letters should be encouraged to produce drawings (developmentally an earlier stage of creative expression).

PLANNING FOR GROUP INSTRUCTION

Teachers will typically provide opportunities for children to interact in large and small groups, during both structured and less structured activities. It is important to plan for interactions between students. For those with physical disabilities, the team will need to plan for positioning and mobility. Those students who require augmentative communication will need to have access to their communication systems (either low or high tech). They may consider training select students to be peer models. Older students may be encouraged to participate as peer tutors. Team members must determine the level and type of cues and prompts that each student will require in order to participate successfully (see Table 3-1). Establishing individual goals within an activity, rather than sharing goals of typical peers, can help teachers address the needs of all the children.

CREATING A TECHNOLOGY "FRIENDLY" ENVIRONMENT

It is important to develop a plan for implementing assistive technology into the daily classroom routines. An effective way to accomplish this is to engineer the school environment. An engineered classroom is one that has assistive technology easily accessible to children and staff. In terms of AAC, it means that the classroom is a symbol-rich environment. For play, it means that modifications have been made to meet the needs of individual children. For computers, it means that appropriate software, keyboard adaptations, switch access and computer station setup meet the needs of the children.

Engineering for AAC

When 'engineering' a preschool environment, focus initial attempts on overlaying AAC on activities that are already taking place within the classroom environment (Goossens', Crain & Elder, 1992). Instructions for creating symbol displays can be found in Appendix A. Below are some points to consider when engineering your classroom for AAC.

- Take pictures of various interest areas to be used during free choice. Keep one picture in the interest area and a copy at circle.

- You may want to use symbols for making choices during freeplay. In this case, we hang the symbol from a string over the general area where the activity will take place.

- Work samples can be used as symbols to represent small group activities.

- Remember that symbol displays can be used for both receptive and expressive language, so be careful to make displays that have sufficient vocabulary to provide meaningful interactions.

- To use the "aided language stimulation" approach to develop receptive language skills, many activity-specific symbol displays must be available throughout the classroom. Goossen's, Crain and Elder's book Engineering the Preschool Environment for Interactive, Symbolic Communication (1992) is an excellent resource for step-by-step instructions for engineering the classroom for AAC.

- Develop visual aides according to suggestions in Visual Strategies for Improving Communication (Hodgdon, 1995).

- If a specific child already has an augmentative communication system, either low tech symbol displays or a voice output device, make sure it is being used throughout the day.

- You may need to use classroom devices and symbol sets when a child's personal system does not cover all the vocabulary needed in the classroom on a daily basis.

- Develop a plan for changing overlays or recordings on devices.

- Consider how devices will be moved around the room, especially for children who are unable to independently carry their devices.

Storage for AAC Support

Once you have symbol support in both low and high tech formats, you will want to display it in a way that provides fast, easy access for both adults and children. Symbol support and voice output devices will not be used if they can not be retrieved in a short period of time. If all the 16 location symbol boards are put in a file drawer or in the closet, the moment is lost between the time the child is interested in an activity and the time it takes to find the right display. For quick retrieval, displays can be stored on:

- Walls
- The back of shelving
- The back inside walls of shelving
- The inside or outside of cabinet doors
- Chalk boards
- Bulletin boards

Velcro can be used to adhere displays to these locations and allow for quick removal and replacement.

Large group times pose the greatest challenge for engineering since there are so many activities occurring in a short period of time (attendance, helper choices, calendar, weather, songs, bookreading etc.). Some possibilities include:

- Putting individual choices in plastic bags or store them in a shoe pocket holder, reducing search time for specific items.
- Placing charts with specific symbols attached low to the floor, since everyone will generally be sitting on the floor.
- Mounting velcro choiceboards on the wall.

Snack and cooking areas lend themselves to putting symbols inside cabinet doors. You can:

- Adhere individual symbols with velcro inside cabinet doors in the kitchen or snack area.
- Put symbols for each recipe made in baggies, which can be stored inside the cabinet doors as well or put in a shoe pocket holder.
- Keep a recipe chart available, which will hold new recipes each time. For example divide the chart into "Ingredients" and "Directions" and leave velcro pieces to put on new ingredients and directions for each activity. This will provide some structure and predictability to the activity.

Engineering for Play

- Use predictable play routines with children who have difficulty learning new skills. Use symbol support and similar materials.
- Arrange toys on low shelves for child access. Label with a symbol for independence in returning the item.
- Provide a variety of play materials, and rotate according to the theme or interests of the children. Include items representing diverse cultural backgrounds.
- Attach cookie sheets to the walls for use with toys that have been modified by attaching magnetic strips to the parts.
- Add handles to puzzle pieces.
- Store grasping aides in shoe pocket holders or velcro to shelves where they would be used.

- If you do not want the battery operated toys down on the shelf, have pictures of the items adhered to the shelf so that the children can request one.

- Keep an adapted play toolbox handy. Include extra battery interrupters, batteries, cork, dowels, pony tail holders, hot glue, hot glue gun, small screwdriver, sticky tape, electrical tape and magnetic tape.

Engineering for Computers

There are many ways to enhance the availability of the computer area for students as well as for adults in terms of accessibility of support materials. Consider the following:

- Design a computer station that is accessible to young children. A custom cart with adjustable shelves and strong casters is highly recommended. If this is not possible, a stable utility cart or child table will work.

- Shelves should be adjustable in order to position the keyboard for individual children.

- Look beyond traditionsl monitor placements. The monitor should always be at eye level, but can be positioned anywhere: on the floor, in a cube chair, on a cart.

- Placing the monitor near the floor will allow children to reach a touch screen. For those who still cannot reach the screen, a copy of the screen can be printed out and taped to the bottom of a detachable touch screen. The screen can then be positioned on the table, a slantboard, or the floor.

- If the computer station is mobile, the computer can be used in different activities when appropriate (printing recipes in the housekeeping area, singing at large group time, reading stories in a quiet area, etc.)

- If the computer cannot be moved, choose a place that will allow access to a small group of children (about 3-4) without disturbing other activities in the room.

- Label disks. Apple II series disks come in paper sleeves. Use the sleeve to type a brief description of the program and applications. Any hints for teachers should be included. Use colored dots to mark which peripherals may be used (e.g. IntelliKeys, PowerPad, switch, etc.). Place a large sticker across the disk and the sleeve. When you separate the disk from the sleeve, the sticker should be cut in half. This will help students put disks away in the proper place.

- Use the same color-coding system to mark plugs and the place they attach on the computer.

- Use KidDesk to organize files on Macintosh and IBM/compatibles.

- Place generic symbols around the monitor of the screen.
- Velcro a flashlight to the back of the monitor.
- Place a small mirror on top of the monitor to see where children are looking.
- Use a shoe pocket holder near the computer with packages of symbols for specific software.
- Keep additional props to complement software for the current classroom "theme" near the computer.
- If you use a PowerPad with pins that may easily bend, place a small toothbrush traveling case on the end of the cord.
- Use an IntelliKeys with an extra long cable and a covered monitor during group activities for a voice output communication device.
- Place keyboards, standard or adapted, on an easel or slantboard.
- Name your computer. This is especially helpful if you have more than one computer. It helps students identify the computer and makes teachers more comfortable with the technology. A little personality goes a long way!

In summary then, engineering the environment means using assistive technology in meaningful, practical ways, which are specific to each classroom routine and activity and displayed/stored in convenient, accessible locations.

ORGANIZATION OF THE DAILY SCHEDULE

Developing a consistent and predictable daily schedule can help students build trust in their environment and make predictions about their behavior. This is particularly true for students with special needs, who sometimes rely on teachers to help them organize their world. Children can learn which activities are likely to occur, and in what order. According to the *Quality Indicators for Inclusive Preschool Classrooms* (Infant Child Communications Programs, 1995b), teachers should "offer a balance between active and quiet time; indoor and outdoor play; and structured free play and group activities. Adequate time should also be allotted for arrival and departure, toileting, transitions and snack." Children should have an opportunity to learn through hands-on, experiential based activities. Related service personnel (e.g., occupational therapy, physical therapy, speech/language pathology) can provide input and support within the context of daily activities.

Routines and Interest Areas

Most early childhood classrooms maintain a predictable daily schedule. This helps children learn what will happen next and to handle transitions between activities. Routines are periods of time during that schedule and can be used for the establishment of functional goals. Routines which are familiar, repeatable, predictable and individualized will help children learn to participate at a higher and more complex level (Infant Child Communication Research Programs, 1995a). Home routines may include mealtime, dressing, bathtime and bedtime. Typical classroom routines include: opening group, structured freeplay (center-based activities), small groups, transitions, toileting, outdoor play, and snack. Interest areas include library corner, blocks, housekeeping area, etc.

In previous chapters, we defined different areas of assistive technology and attempted to describe some of the pieces of equipment. This chapter is intended to give readers a feel for the many ways assistive technology can be used during classroom routines and frequently occurring activities. These activities are offered as examples, keeping in mind that each classroom has unique needs.

Opening / Closing Routines

Opening and closing routines tend to be conducted in large groups, with the teacher directing. Because the children often sit in a circle around the teacher, it is typically called "circletime." Many teachers encourage all children to attend at least part of the time. However, it is important that the activities are motivating and keep children□s interest. Try to limit structured group time to 15 minutes or less. The teacher must be flexible enough to stop or modify activities which do not involve all students. Activities which occur repeatedly during the circletime routine offer many learning opportunities: choosing a helper, placing a name tag on the attendance chart, counting the days of the month, naming the days of the week, singing familiar songs, participating in fingerplays, show and tell, listening to a story, choosing a peer to play with, choosing an area to play, etc. Table 6-1, at the end of this chapter, provides examples of high and low technology which can be used during typical large group activities.

In Mrs. Smith's classroom, Brian is learning how to use a switch for single messages. At home, he uses a Voice Print Picture Frame (Wal-Mart) which has been modified for a large target area with cardboard, foam and an eraser. His mother records messages from home to share at school when interesting things happen. Brian knows that when the Picture Frame is put in his backpack, he has something to share at circletime. As the students sit down on their mats, Brian is placed in a tumbleform chair between two typical children. One child, Jenny, really enjoys helping Brian and has recently started looking for his Picture Frame in his backpack when he arrives at school. She brings it with her now as she sits down next to Brian at circle. When it is his turn for sharing, Jenny puts the Picture Frame on Brian's lap. Brian hits the switch and it says, WE GOT A NEW DOG. HIS NAME IS BOUNCER. All the children look to see the picture attached to the switch. Eventually, Brian will learn how to wait his turn to talk and the switch will be positioned so it is always in front of him. For now, the Picture Frame is put by the door so the teacher remembers to record a message when he goes home.

Later, Mrs. Smith brings out a symbol chart for choosing songs. Tommy selects a song by pulling a symbol off the chart. It is the symbol for "If You're Happy and You Know It." The symbol is velcroed on a BIGmack and the aide helps Tommy record the line, IF YOU'RE HAPPY AND YOU KNOW IT. Tommy then hands the BIGmack to Jessica. She pushes the switch and then touches her stomach. All the students sing, "If you're happy and you know it touch your tummy." The Bigmack is then passed on for the next student to have a turn. When it is Brian's turn, Jenny holds the BIGmack in front of him. Brian hits the switch and closes his eyes. The class sings, "If you're happy and you know it close your eyes."

In Mr. Bill's preschool, the students are reading "Brown bear, brown bear, what do you see?" Each child is holding a symbol of an animal. The paraprofessional, Miss Julie, begins by reading, "Brown bear, brown bear, what do you see?... I see a ..." She then looks around the circle and waits for the children to guess. Ellen is holding the red bird. She jumps up and says "red bird!" She brings the symbol up to Miss Julie and pushes the matching symbol on the Hawk (Zygo) to say I SEE A RED BIRD LOOKING AT ME. Miss Julie reads, "red bird, red bird, what do your see?" and pauses again. Another child comes up and pushes the corresponding symbol on the Hawk. When it is Joey's turn, Mr. Bill helps him walk by supporting Joey at the hips. Joey's symbol is velcroed on a pony tail holder and wrapped around his wrist so he doesn't drop it as he approaches Miss Julie.

Miss Amy has figured out a new way to use Raul's switch toy (a bump 'n go action train) during circletime. She sets down a piece of linoleum flooring about 4" square and places a hula hoop in the center. Five children are invited to sit around the hula hoop. Raul's train is placed in the center. Miss Amy then takes down one of the helper symbols and places it on the train. When Raul hits the switch, the train starts moving around in the circle of the hula hoop. Raul releases the switch when the train is in front of Becky. Miss Amy announces, "Becky will be the snack helper today" and places Becky's picture and the symbol on the helper chart. Becky goes back to her mat and another child takes her place at the hula hoop. Miss Amy places the next symbol on the train and Raul chooses another helper. This continues until all the helpers are chosen.

Interest Areas: Structured Freeplay

In many classroom schedules, children are released to play following circletime. This time may be called "center time" or "center-based activities." "Centers" refer to the interest areas in the room where children may play. "Structured freeplay" refers to purposeful organization of play in order to address special needs of children in the classroom. The activities are child- selected and child-directed. The structure is evident only in the way teachers plan activities, make materials accessible and help children learn play routines. Routines can be established for many activities. Interactive scripts can be written for a whole range of pretend play activities such as playing doctor, house, or dress-up. Additional material on adapting play and modifying play environments can be found in Table 4-1 and Appendix A. Ideas for including low and high technology in center-based activities can be found in Table 6-2.

This month, the play center in Jason's classroom is a zoo, complete with plastic zoo animals, blocks for building cages, paper for the zoo keeper to take notes on sick animals, buckets and pretend food. A communication display has been prepared and programmed into Jason's Macaw (Zygo). Single-word vocabulary allows him to generate sentences such as: TIME TO ... FEED ... MONKEY. UH OH! ... MONKEY ... IS ... SICK. CALL ... THE VET!

In another classroom, the dramatic area is set up as a pretend washing center while they read the story "Dirty Duds" (Storytime, Creative Communicating) during circletime. Cardboard boxes have been turned into a washer and a dryer. Four children are having fun undressing a large doll and putting her clothes in the washer, then chanting "Wishy washy, wishy washy, wash wash wash." A Wolf (Adamlab) is sitting next to the washer, so that the children can use it to say things such as : UH-OH! DIRTY ... PANTS! PUT IN ... WASHER ... WISHY WASHY, etc.

Thin "notebook" switches can be placed directly in the play environment so that children can produce sound effects while they play (Burkhart, 1993). For example, Brian is playing with the Cabbage Patch doll. When he presses her bonnet, she cries, pressing her bib yields slurping sounds, patting her back produces a burp, and touching her diaper results in !!! The four hidden switches are attached to the remote-switch device, Cheap Talk 4 Switch Module (Toys for Special Children). In the kitchen, remote switches could be used to start a fire alarm or buzzer on the stove, to ring the telephone, to sound like water running at the sink, etc.

Students in Ms. Showalter's preschool love using the computer for group activities, and often choose the computer during center time. A number of programs have been preselected and placed on the screen using *KidDesk*, so the teacher doesn't have to load programs. Today a small group of children are taking turns playing "The Letter Machine" on *Bailey's Book House*. Greg, who has visual impairments, is using the Big Keys Keyboard, because the keys are enlarged. This Keyboard also works well for 4-year-old Molly, since her fine motor skills are somewhat delayed. Typical students Julia and Curtis like the new keyboard because of the colorful keys. Ms. Showalter notes that Julia, who knows most of the letters, finds them much more quickly now that she has switched to Big Keys, with the letters arranged in alphabetical order.

In Mrs. Mitchell's class are several students with severe visual and hearing impairments. Last year she wrote a "mini-grant" to get money for toys that would provide enjoyable fun early play experiences for these students. The ones her students seem to like best are the Busy Box Activity Centers (Enabling Devices), such as the Visually and Hearing Impaired Activity Center. It includes a spinning soft cloth, a vibrating plate and a fan that is turned on by a pull-ball. Another Busy Box has a bright orange plate that the students press to turn on an AM radio.

Jenna is a three year old whose most common play behavior is to throw toys for others to retrieve. A "play board" made out of an old purse is perfect for her. Items such as a plastic brush, unbreakable mirror, small change purse, squeeze flashlight and plastic keys are attached to pieces of elastic and connected to the bottom of the purse. When Jenna first begins to play with the purse, she throws the items as usual. Surprise! They don't go very far. Gradually, Jenna begins to explore the items, since they remain available to her.

Alexandra loves baby dolls, but has very limited play behaviors with them. Her therapist, Kelly, wonders if this is because Alexandra has limited movement skills, and finds it hard to crawl to get extra play items, such as a blanket, bottle or pacifier for the baby. Also, Alexandra often drops items, including the baby doll, then cries until someone picks them up for her. Kelly decides to see if attaching a baby doll and related play materials to a play board would help her play enjoyment and development. Kelly created a play board using indoor/outdoor carpet, velcro, and elastic. She placed the play board on a slantboard, so that Alexandra could keep her head in a more upright position while playing with the baby set. This is very helpful for Alexandra, in increasing her head control, trunk stability and use of her hands. Having her head upright also helps Alexandra to drool less. Alexandra was very excited about her new toy. She and a friend, Natasha, played with it for the entire center time for three days in a row! Kelly stayed in the background to help for the first day, but Alexandra had far more independence now that she could retrieve items that she dropped.

The book corner in Mrs. Wiley's preschool is a favorite center, especially since they added a slide projector. A curtain is drawn across a corner of the room to provide a dark area. This week the slide projector is loaded with "Five Green and Speckled Frogs." An adapted slide projector (AbleNet) is set up to enable Julie to advance the slides by pressing her switch. Another student stands at the wall and points to the words with a long stick as she reads the story (pretending to be the teacher). As she finishes reading each page, she looks at Jenna and says, "you may change the page now, Jenna." The children giggle and later take turns playing teacher.

Small Groups

As opposed to large group activities, which tend to be teacher-directed, small groups can be carefully planned to invite child-direction. In this case, the teacher becomes a facilitator and plays a supportive rather than directive role. Math, science, social studies, health, etc. can be integrated through meaningful activities (e.g., building with blocks, measuring sand, observing changes in the environment, sorting toys during clean-up, listening to music from various cultures, etc.). Table 6-3 lists some ideas for using low and high technology with small groups.

Maria's class is making styrofoam/ pipe cleaner spiders at the art center. When another teacher comes in the room, she presses her switch (attached to a loop tape) to say HEY LOOK! WE'RE MAKING FUNNY SPIDERS!

Students in another class are using Twirl-O-Paint™ to make paper clothing items look dirty, to follow-up the story, "Dirty Duds." Katie, who has poor use of her hands, uses her eyes to help her point. Her partner, Ramon, holds up the pants and the shirt, and asks Katie which one she wants to paint. Katie looks at the shirt, so he puts it on the Twirl-O-Paint. Then he holds up two colors of paint and Katie chooses the red one by looking at it. Mrs. Roberts, the paraprofessional, then holds up a choiceboard with the numbers 1 to 5. Katie looks at the number "4" and Mrs. Roberts asks "Four drops of paint, Katie?" Katie smiles and uses her buddy switch (TASH) to turn on the Twirl-O-Paint. Ramon helps Mrs. Roberts squeeze out four drops of red paint.

Students in Mr. Cruz's kindergarten class are learning about dinosaurs during science. Since Mr. Cruz learned how easy it is to create software using *IntelliPics* (IntelliTools), he has helped students create a number of their own programs. Last week they they colored pictures using *KidPix Studio* (Broderbund). Today they are adding sounds effects and words to put them in a story using *IntelliPics*. Tyson, who has cerebral palsy, worked with a partner to draw a picture, using eye gaze to choose color choices. When the story is finished, he will use a single switch (connected to IntelliKeys) to read the story to the parents on Parent Day.

Transitions

Transitions between activities can be difficult for all young children. They may not want to leave a motivating activity and they may not understand what they are expected to do next. In addition, children who have severe physical impairments may need help with mobility and positioning. Establishing transition routines will help children learn what comes next. When transitioning from circletime to freeplay, symbol choices of activities may help children develop a plan of movement. A song or a warning bell 2-3 minutes before terminating free play may help children get themselves ready to clean up. Children who have difficulty with clean-up can be assigned jobs in order to participate.

In Ms. Tripp's classroom, children are selected as helpers during circletime. This week, Angelica is selected to ring the clean-up bell. After the children have played for about 20 minutes, Ms. Tripp whispers to Angelica that it is time to ring the clean up bell. When the bell is rung, Ms. Tripp sets a clock timer for two minutes and sings, "In two more minutes we will clean, in two more minutes we will clean." She then sets up Freddy, who has visual and motor impairments, to play the clean-up song on a loop tape attached to a single switch which he pushes with his feet. All the children sing along as they clean.

Toileting

Most typical children in preschool classrooms come to school toilet-trained. Others who have developmental delays or physical disabilities may need assistance. Of course, the bathroom must to be equipped for student needs, including a diaper changing area if applicable.

In Ms. Steitz's classroom, Molly is learning a toileting routine. Every two hours, she is led into the bathroom by a staff member. This time it is Mrs. Steitz's turn. She approaches Molly and shows her the bathroom symbol. She wheels Molly into the bathroom. Mrs. Steitz pulls a symbol board off the wall and points to symbols while she says, PULL DOWN PANTS and then helps Molly stand up and place her hands at the waistline of her pants. Mrs. Steitz waits for Molly to help push before lowering her pants. Each step in the routine, including washing hands, is preceeded by pointing to the symbol on the display as she says the words and waiting for a response from Molly.

Outdoor Play

Outdoor play can be a challenging environment for children with technology needs. Remembering to address all sensory and motor needs of children may help take the pressure off always trying to have a high tech solution for every child for every situation. Playground equipment and materials can be used to address coordination, mobility, strengthening, and fine motor skills. Planned group interaction or games may be used to establish routines for communication and use of augmentative communication techniques. Please see Table 6-4 for ideas about high and low technology which can be used during outdoor play.

Ms. Price's preschool class consists of a number of children with varying levels of developmental delays and physical disabilities. During outdoor play, the water table is set up with many fun pouring items, plus a variety of boats and plastic ducks. A 16-symbol picture board is attached to the water table (It has been laminated two times to keep out the water). Ms. Showalter models use of the symbols for Juan, who is nonverbal but does not use the symbols by himself yet. She uses a small flashlight attached to a cord around her neck to highlight symbols. Juan watches carefully, but does not point to any of the symbols himself, and Ms. Showalter does not force him to point.

Mrs. Bell's kindergarten class enjoys playing "Red Light, Green Light" during recess. Although Maggie is in a manual wheelchair and is just learning to use switches to communicate, her friends think of ways to include her. They choose a paved area where Julie can help push Maggie when they start the game. When it is Maggie's turn to call "red light, green light," they record the messages on the Say-It Rocking Switch Plate (Enabling Devices). The device is placed on Maggie's lap tray and a friend helps yell out the messages Maggie selects, so that all students can hear. She also helps Maggie remember to select "red light" by pointing to the symbol on the switch and sometimes even puts Maggie's hand on the "red" switch (especially when the other children are getting really close).

Snack / Cooking Routines

Many preschools handle snack and cooking differently. Some teachers prefer to eat snack as a large group while others have an open snack bar for children to help themselves when they are ready. Cooking may also be accomplished in a large or small group format. In any case, it is important to establish a routine which works for your classroom to meet the needs of the students. Ideas for high and low technology to be used during snack and cooking activities can be found in Table 6-5.

In Mrs. Jones kindergarten, a group of four children are making peanut butter butterflies (Book Cooks) for snack. A previous group had colored the recipe cards, cut them apart, attached them to blank cards with a magnetic strip for the Mini Talking Card Reader, and recorded the directions on each card. Karen, who is nonverbal and has autism, places the cards in order on a choice board by looking at the numbers in the upper left hand corner. Each child then closes his/her eyes and pulls off a card. Manuel claims, "I got number 1, I go first." He hands the card to Karen, who places it in the Mini Talking Card Reader. The recorded voice reads a list of ingredients. While Karen puts the card back on the choice board, Manuel gets out the pretzels, peanut butter and celery. The procedure continues, with each child handing the card to Karen (even when she has wandered to another part of the room) and completing the task once the card has been read. When it is Karen's turn, she places the card in the Mini Talking Card Reader but does not follow the directions. She is tactile defensive and doesn't want to touch the peanut butter. The teacher signs "help" and asks another student to spread the peanut butter on the celery.

In Ms. Peter's preschool classroom, students can get snack during center time. She places a tray of graham crackers and a small pitcher of water on the table. She then rings a bell and announces, "snack bar is open." Six children come over to the table. She hands out four ponytail holders with snack symbols attached, saying, "When you finish snack, be sure to give the snack band to a friend." The two students without snack bands go back to playing in the housekeeping area. The students help themselves to snack and leave as they finish. When Cindy finishes her snack, she helps put the snack band on Christopher, who was playing at the computer, and asks him if he is ready for snack. In response to his smile, she unplugs his switch and pushes him in his wheelchair to the snack table. Ms. Peter attaches the cord from his switch to a Pouring Switch, enabling Christopher to pour a cup of water for himself.

Interactive, useful and fun messages can be chosen to direct and talk about cooking. Samples include: LOOK AT MINE; GIVE ME A LOT; THAT'S ENOUGH; NO, DON'T!; HELP ME PLEASE; IT'S YUCKIE. Jason's teacher copied the 32-location Macaw overlay for Food Preparation from the Communication Displays Book II (Goossens', Crain & Elder, 1994). They used velcro to add extra symbols to the right border of the Macaw grid to represent materials used for today's cooking activity, "Larry Lion" (from The Animal Cookbook). Symbols added include: CARROT SLIVERS, PEANUTS, RAISINS, LICORICE, SPREAD, and SLICE.

FAMILY INVOLVEMENT

Most parents and professionals agree that quality early childhood programs include communication and mutual support between the home and school environments. Meeting the needs of children with disabilities can become even more complicated when external devices (i.e., AAC, computer, adapted play) are required. Therefore, open communication and sharing of materials and strategies is critical. Consider the following suggestions:

- hold an open house
- provide information about the program, goals and activities
- provide parents with information about assistive technology
- whenever possible, send assistive technology home
- share the importance of carrying over activities to the home
- encourage parents to read to their children with disabilities
- train parents of children who use augmentative communication in techniques which they can use to help their child share news between home and school
- involve parents in the evaluation process, providing valuable information about child interests, skills, progress and needs
- ask parents about their observations and ideas
- allow parents to determine to what extent they will be involved in the daily interactions in the classroom (volunteering, providing information, helping to design activities, etc.)
- collaborate on development of goals for their child
- solicit and try out suggestions parents offer
- plan for regular meetings (may include opportunities for parents to meet each other)
- develop a plan for providing feedback on progress toward goals, both at home and school

SUMMARY

As is evident by the many examples included in this chapter, possibilities for infusing technology into early childhood classrooms are practically limitless. Creativity, imagination, and determination are critical. If something works, continue using it. If it doesn't, try it another way. Once it does work, see if you can modify it to work even better. It is important that staff members collaborate to design activities that include all students. Ideas for modifications may come from anyone, including the children themselves or even the maintenance staff! Remember to be observant, open and flexible and children will guide adults in determining what works and what doesn't. The next pages contain Tables with ideas for use of high and low technology in many classroom routines and activities. Following these pages are references and resources for additional information in each area.

TABLE 6-1. ASSISTIVE TECHNOLOGY AND LARGE GROUP ACTIVITIES

	LOW TECHNOLOGY	HIGH TECHNOLOGY
WELCOMING	• photos and/or names of children to move from one chart to another for attendance • 16 location language stimulation board for description of weather • penlight for pointing to symbols	• switch-operated bump-n-go toy inside a hula hoop with photos • good morning song with children greeting each other using a tape recorder with loop tape and switch • rocking switch plate to put 2 helper choices
MUSIC / MOVEMENT	• song chart with symbols for song choices • choiceboard and symbols for frequently sung songs (choice making, sequencing etc.)	• freeze dance activity using a tape recorder and switch to start/stop music • rocking switch plate to request louder/softer music
PLANNING / RECALL	• symbols or photos of centers and/or toys • eyegaze frame with symbol/picture in either corner to make a choice	• switch-operated fireman toy with symbols on the ladder to make choices • attach symbols to remote switches on a voice output device to make choices
BOOK READING	• puppets-stick, bracelet, sock etc. • page fluffers • act out the story using props • Storytime stories reproduced with props • Quick Tech Stories reproduced • book holders/easels • add symbols to pages in books • choice boards	• single message voice output device for repeated line • voice output for sound effects • remote switch voice output device to act out the story • Storytime overlays on voice output devices • Storytime software
SHOW-N-TELL	• make a spinner using a switch and a spin art toy to choose who will go next as well (photos)	• voice output device to ask questions
TRANSITION	• sing a song to dismiss each child by name • symbol schedule to cue to next activity	

TABLE 6-5. ASSISTIVE TECHNOLOGY AND SNACK / COOKING

LOW TECHNOLOGY	HIGH TECHNOLOGY
• 16 location language stimulation board • supplemental symbols depicting ingredients • penlight to point to symbols • recipe chart • snack placemats • chart who likes and who doesn't like the snack • Stories About Me • photos of children making the snack to use as a sequence activity	• single message voice output device to request "more" • voice output with general vocabulary for cooking • pouring switch • environmental control unit • switch activated appliances • AC power control unit (Powerlink 2) • Silly Sandwich (UCLA) software • Cooking Activities I (Edmark) software (making a sandwich) • voice output device with #'s programmed to count ingredients

TABLE 6-2. ASSISTIVE TECHNOLOGY AND CENTER-BASED PLAY

	LOW TECHNOLOGY	HIGH TECHNOLOGY
HOUSEKEEPING/ KITCHEN	• battery-operated mixer, blender • magnets and cookie sheets • velcro • place props from theme in area e.g., The Three Bears • generic symbol display • choiceboard	• pouring switch • devices with messages specific to food preparation, cooking, mealtime and messages specific to theme e.g., The Three Bears
DRAMATIC PLAY	• adapt puppets • adapt battery-operated baby doll, hair dryer • prop boxes: have materials available in play area to re-enact stories or support theme • generic symbol displays	• devices with sounds e.g., fire engine • devices with appropriate vocabulary for re-enacting stories and themes e.g., cashier in an ice cream store
BOOK CORNER	• page fluffers • clothes pins • book holder • generic symbol board • place symbols in book to match symbols on display board	• books on tape - use with a switch • devices with overlays for generic reading, color coded overlays, and overlays with vocabulary for a specific story
GAMES	• adapt spinner • dice shaker • card holders • elastic tops on game pieces e.g., Silly Dillies • switch and loop tape e.g., Listening Lotto	• eye gaze board or rotary scanner to pick pieces (e.g., Mr. Potato Head) • device with overlays for generic game play or for a specific game
ART	• battery-operated fan or scissors • Wiggle-Jiggle Pens • foam curlers (put crayon inside) • clothespins on sponges • attach crayon to top of MegaBlock with wheels	*Clay Play* on computer
BLOCKS/ MANIPULATIVES	• velcro • attach wooden beads to puzzle pieces	Blocks in Motion (Don Johnson, Inc.)
TRANSITIONS	• generic symbol board • pictures of children on cubbies/toys on shelves	Devices with messages specific to greetings/farewells

TABLE 6-3. ASSISTIVE TECHNOLOGY AND SMALL GROUP ACTIVITIES

	LOW TECHNOLOGY	HIGH TECHNOLOGY
ART	• generic symbol displays • supplemental symbols • choiceboards • talking stamps • adapt/create handles for crayons, paint brushes, glue sticks, etc.	• electric scissors with battery adapter or Power Link and switch • spin art • instructions on voice output device • *Kid Pix* • *Thinkin' Things* • *Bailey's Book House* (Kid Card)
MATH	• choiceboards • enlarged counters • velcro • magnets	• *Millie's Math House* • *Thinkin' Things* • battery-operated toy with pieces as counters • use voice output device to ask/answer questions • step scan on Macaw or Wolf
SCIENCE	• loop tape with message about what is taking place • topic book to share news at home	• *The Treehouse* • *Sammy's Science House* • environmental control unit • pouring switch • IntelliKeys
LITERACY	• page fluffers • slot filler activity on choice board • book holder • generic story reading symbol board • mark binder of book with key for adaptations • tape sign or symbol on pages • repeated line • pointing devices	• *IntelliTalk* • *IntelliPics* • Living Books • color-coded displays on voice output device • adapted slide projector
COMPUTERS **(should be used to supplement small group activities)**	• keyboard covers • flap switch • mouse house • symbols placed around monitor	• Touch Window, Discover:Switch/Board/Screen • alternative keyboards: Intellikeys, Key Largo, Power Pad, etc. • on-screen keyboards • Ke:nx / AFC / switch interface • switch adapted mouse, talking word processors

TABLE 6-4. ASSISTIVE TECHNOLOGY AND OUTDOOR ACTIVITIES

	LOW TECHNOLOGY	HIGH TECHNOLOGY
SENSORY ACTIVITIES	• positioning equipment: chair inserts, towels, foam pads, telephone books, foot supports	• positioning equipment: customized seating systems, floor sitters, sidelyers, prone standers, MOVE equipment
PLAYGROUND EQUIPMENT	• child is taken out of wheelchair and positioned on playground equipment with adult support (contact guarding to total assistance) • helmets, protective pads as needed	• commercially available wheelchair / barrier free playground equipment
MOBILITY	• child is placed in wagon • scooter boards with safety straps • adapt tricycle with built-up pedals; enlarged handlebars	• Cooper Car • powered wheelchair
GAMES	• manual choice boards • enlarged handles/grips on game pieces • modify the games: cooperative between children	• voice output devices to direct or participate in activity • dial scanner w/ switches for choice making • battery interrupter and switch for battery activated games/toys: bubble blower

General Resources

Beukelman, D. & Mirenda, P. (1992). Augmentative and Alternative Communication: Management of Severe Communication Disorders in Children and Adults. Baltimore, MD: Paul H. Brookes Publishing Co.

Burkhart, L. (1993). Total Augmentative Communication in the Early Childhood Classroom. Eldersburg, MD: Author.

Burkhart, L. (1987). Using Computers and Speech Synthesis to Facilitate Communicative Interaction with Young and/or Severely Handicapped Children. Eldersburg, MD: Author.

Elder, P. & Goossens', C. (1994). Engineering Training Environments for Interactive Augmentative Communication: Strategies for Adolescents and Adults who are Moderately/Severely Developmentally Delayed. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Goossens', C, Crain, S., & Elder, P. (1992). Engineering the Classroom Environment for Interactive Symbolic Communication: An Emphasis on the Developmental Period 18 months to Five years. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Infant Child Communication Research Programs. (1995). Comprehensive Inclusion for Young Children with Disabilities: Issues, Guidelines, and Practical Strategies. Tempe, AZ: Arizona State University.

Infant Child Communication Research Programs. (1995). Quality Indicators for Inclusive Preschool Classrooms: A Self-Study Assessment and Planning Guide. Tempe, AZ: Arizona State University.

King De-Baun, P. (1989). Storytime: Stories, Symbols and Emergent Literacy Activities for Young, Special Needs Children. Park City, UT: Creative Communicating.

Mann, W.C. & Lane, J.P. (1995). Assistive Technology for Persons with Disabilities. Bethesda, MD: The American Occupational Therapy Association, Inc.

Trace Center. (1996-97). Trace Resource Book: Assistive Technologies for Communication, Control, and Computer Access. Madison, WI: Trace Center Reprint Service.

Bruno, J. (1991). Book Cooks. Cypress, CA: Creative Teaching Press, Inc.

Johnson, B. & Plemons, B. (1978). Cup Cooking. Lake Alfred, FL: Early Educators Press. Mervine, P., Mark, M., & Burton, M. (1995). I Can Cook Too!. Solana Beach, CA: Mayer-Johnson Co.

Literacy

Kelly, J. & Friend, T. (1994). Hands-On Reading. Solana Beach, CA: Mayer-Johnson Co. Also available: More Hands-On Reading.

King-DeBaun, P. (1994). Storytime Holiday Fun!: Stories, Symbols, and Emergent Literacy Activities for Young Children. Park City, UT: Creative Communicating. Also available: Storytime and Storytime: Just for Fun.

Richman, L.G. (1988). Stories About Me. Solana Beach, CA: Mayer-Johnson Co.

McNairn, P. & Shiolena, C. (1994). Quick Tech Readable, Repeatable Stories and Activities. Solana Beach, CA: Mayer-Johnson Co.

Musselwhite, C. (1992). SONGBOOK: Signs and Symbols for Children. Litchfield Park, AZ: Special Communications.

Musselwhite, C. & King-DeBaun, P. (1997). Emergent Literacy Success: Merging Technology and Whole Language for Students with Disabilities. Birmingham, AL: Southeast Augmentative Communication Conference Publication Clinician Series.

Play

Berger, A. & Bolbach, K. Adaptive Switch Technology. Kew Garden Hills, NY: Steppingstone Day School, Inc.

Goossens', C. & Crain, S. (1992). Utilizing Switch Interfaces with Children who are Severely Physically Challenged. Austin, TX: Pro-Ed.

Goossens', C., Crain, S., & Elder, P. (1994). Communication Displays for Engineered Preschool Environments. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Musselwhite, C. (1985). Adaptive Play for Special Needs Children. Litchfield Park, AZ: Special Communications.

Rappaport Morris, L. & Schulz, L. Creative Play Activities for Children with Disabilities. Champaigne, IL: Human Kinetics Book.

VII.

ASSISTIVE TECHNOLOGY AND THE IEP

INTEGRATING TECHNOLOGY IN THE IEP

As emphasized in previous sections of this manual, appropriate use of assistive technology can help students participate in daily classroom activities. An Individual Education Plan (IEP) is written for a student with the intention of outlining learning objectives to be targeted during those same classroom activities. In addition, necessary resources, materials and strategies may be outlined in the IEP. As such, the IEP process is a perfect opportunity for team members to discuss specific responsibilities of teachers, aides and therapists. Remember, parents must be considered equal members of the decision-making group, involved in the identification, assessment, placement and provision of special education services. Their contributions and concerns must be considered in developing and reviewing the IEP. An IEP should include the following components:

- A statement of the child's present levels of educational performance;
- A statement of measurable annual goals and short-term objectives;
- A statement of the special education and related services and supplementary aids and services to be provided (including modifications and supports for school personnel);
- An explanation of the extent to which the student will participate with nondisabled peers;
- A statement of individual modifications to assessments that are needed;
- The projected date for beginning of services, as well as the anticipated frequency, duration, and location of those services and modifications;
- A statement of transition services for students involving interagency responsibilities; and
- A statement of how the child's progress will be measures, as well as the method of reporting that progress to the parents.

According to the legal mandates (IDEA Ammendments of 1997), assistive technology must be considered by the IEP team at every IEP meeting of every child eligible under IDEA, regardless of disability. Assistive technology may be included in the IEP as the intervention strategy, the material, or the means to obtain a goal or outcome. You can include information about support groups, technology loan libraries, written resource materials and training needs in the IEP. Be sure that mastery of a piece of equipment is not the end goal (Jones & Sloand-Armstrong, 1995; Van Tatenhove, 1993). Rather, the technology should be used as a means of achieving a functional goal. Functional goals result in implementation of services (i.e., occupational therapy, physical therapy, speech/ language therapy) during classroom activities rather than using the "pull-out" model. When goals are written functionally for maximum participation in classroom activities, inclusion of assistive technology should occur naturally.

WRITING FUNCTIONAL GOALS AND OBJECTIVES

The following suggestions can serve as guidelines for writing functional goals and objectives (Gallivan-Fenlon, 1994; Infant Child Communication Research Programs, 1995a). These suggestions are indicated for all students with special needs, not just those using assistive technology. Specific examples for children using technology follow each suggestion. Note that both the technology and how it is to be used are described in the objective.

Natural cues: Can the environment be manipulated to elicit the behavior naturally? For example, snack can be given in small portions to encourage requesting. A communication device or symbol may be placed within reach for a child who is unable to make his needs known verbally.

Example: Joshua will request more of a desired food or drink item by selecting one of two symbols on a two message voice output communication device or pointing to symbols on a symbol choice board at least 3 times per snack.

Critical effect: Does the demonstration of the skill result in an effect which is critical to completion of a task or otherwise motivating to the student? In the example above, the critical effect is receipt of a cookie when requested. A critical effect may also include holding a switch in order for a group students to listen to music or participate in a game.

Example: When provided with a switch adapted tape player, Maggie will participate in group play at least once per day.

Age appropriate: Select goals and materials which are chronologically age-appropriate. If the child requires lots of sound and light stimulation, design activities or a light/sound corner rather than using baby play boards or rattles.

Example: Ricky will track a light source for at least 5 seconds during flashlight tag with peers.

Increases independence: Will the acquisition of this skill reduce the amount of dependency on others? Look for opportunities to teach skills which are currently being done for the child. For example, moving from one location to another. A scooter may be used by the child for independent mobility.

Example: James will independently move between play centers or activities when positioned on a prone scooter.

Useful: Will the skill be useful in current and future environments? An objective which is written for matching objects to pictures does not appear immediately useful. However, selecting symbols from a choice board to indicate which items he/she wants to play with during free play will address this skill in a way that helps the child interact in his current environment. In the future, identifying symbols and making choices will most likely be an essential part of effective communication.

Example: Becky will choose a play area by pointing to a picture symbol and independently move to the area of choice for 5 consecutive days.

Promotes interaction: Does the skill promote interaction with others? Objectives which are carefully designed to encourage interaction among students will begin to develop relationships among peers and establish rules for friendships. This does not happen naturally with children who have disabilities, especially for students who have severe communication impairments.

Example: While playing at the computer with a peer, Danny will click on selections after a peer positions the mouse for at least three different computer programs (e.g., Bailey's Book House, Just Grandma & Me, KidPix Studio). Materials: switch adapted mouse with the switch positioned at Danny's right knee.

Natural context: Is the skill taught in a natural context in order to promote generalization? For example, training identification of symbols during play activities will result in skills which can be used to play at home and at school.

Example: Jenny will direct others and participate in play using a sequence of at least two symbols ("more" + Noun, "want" + Noun, or Adj. + Noun) as needed, daily.

Example: While positioned at the computer with appropriate lateral and head support, Victor will eye gaze to the computer program of choice when shown the photos on the box covers.

Addresses family needs: Does the family agree that the skills are important for all environments? Seek family input for planning generalization and critical skills. Consider activities which occur both at home and at school (e.g., eating, washing hands, playing with toys, reading stories, etc.).

Example: Christopher will play cooperatively with peers for at least 5 minutes during free play. As needed, he will use a latch/timer, switches and various battery operated toys.

Example: Maggie will activate a switch (connected to the PowerLink 2) within three seconds of a nonverbal or indirect verbal cue to participate in cooking activities (e.g., turning on a blender, popcorn popper, electric mixer, etc).

IMPLEMENTING THE IEP: COMPREHENSIVE TECHNOLOGY SUPPORT PLANS

Team members must meet regularly to evaluate individual child progress and discuss dynamics of the entire classroom. All objectives may not be addressed simultaneously, especially as they relate to technology. During team meetings, priorities are selected and strategies are outlined for implementing the IEP. The authors of this manual suggest using the Comprehensive Technology Support Plan for this purpose (Appendix C). Case studies and examples of plans can be found in the next section. The Comprehensive Technology Support Plan outlines the following components in relation to the daily classroom schedule:

Individual Objective - This objective may be taken directly from the IEP, or may document even smaller increments of progress. For example, if the IEP objective is to spontaneously select a symbol from a choice board, the initial objective during transition from opening group may be to look at the choices before pointing.

Selection of Materials/Technology - Outline specific materials. Initially, you may want to include which type of symbols, how many, whether color-coded, specific adaptations to toys, where to plug in the switch on the tape recorder, etc. Remember to use materials which will promote generalization to other areas. Symbols constructed for use during small group cooking activities can also be placed in the housekeeping area for dramatic play.

Environmental/Intervention Strategies - Indicate how the activity will be conducted and what level of cues will be required. Include positioning of the child and device here. Discuss what the hierarchy of cues will be for this child, aiming for the greatest amount of independence possible.

Peer Involvement - Plan for peer interactions. This may not occur naturally. Set up a plan for teaching and reinforcing peers. Look for opportunities for play with items which are motivating to all children. Teach peers how to present choice boards or other items in order to reduce dependence on teachers.

Suggestions for Writing Comprehensive Technology Support Plans

- Videotape the classroom first. This gives information on how teachers respond to students, how students respond to each other and which activities are most motivating. Look to see where students spend the majority of their time.
- The Quality Indicators checklist (Infant Child Communication Research Programs, 1995b) may also be used to get ideas and identify areas of relative strength and weakness in the classroom. This checklist addresses best practices in the areas of family centered services, social integration, child outcomes, management of behavior, curriculum content, planning, instructional integration, facilitating strategies, physical environment and assistive technology.
- Meet with the entire team and meet regularly. Do not try to write a plan alone!
- Start small. Fill in one (or two) objectives for each targeted child.

- Expect the first meeting to take at least one hour (some teams allocated an entire morning), while you discuss options and share opinions. Allow everyone the opportunity to discuss concerns about technology and student needs.
- When possible, choose activities which are highly motivating to all students.
- Begin with an activity which you think the child can perform successfully. Even if the first objective is achieved within two weeks or the very first time, successful implementation of technology will help students and staff become more comfortable with its use.
- Try to divide responsibilities among team members. Write objectives for students during different times of the day to involve as many staff members as possible. However, be aware of any "technophobics" and demonstrate activities for staff members who are afraid of using the technology before the team assigns them responsibilities.
- Remember that creativity, flexibility and keen observation skills will be your most valuable resources. Accept and consider ideas from everyone, including maintenance staff, parents and the students themselves.
- Pat yourself on the back regularly for doing everything you can, especially given the hectic pace and many demands of early childhood education.

DEVELOPING COMPREHENSIVE TECHNOLOGY PLANS: CASE STUDIES

This section provides case studies and Comprehensive Technology Integration Plans developed for each child. It is important to note that each situation is unique and children with similar disabilities in other classrooms may require very different objectives and interventions based on the individual routines and activities ocurring in that classroom. Therefore, the first three case studies begin with a description of the classroom and typical routines. We have included three children with different needs to address a variety of technology integration ideas for classrooms. They focus on augmentative communication, adaptive play and computer access. Following each case study are a number of questions to be discussed before reading the Comprehensive Technology Integration Plan for each child. The fourth case study describes a plan developed for integration of technology into the home environment.

Case Study 1

Mark is a 5 year, 6 month old child with a diagnosis of severe verbal apraxia. He has received intensive speech/language treatment since his third birthday and remains mostly nonverbal. He currently attends a whole language-based kindergarten in a public school. The classroom consists of 13 students, with 3 students identified as having special needs. There is one teacher and two teacher aides. Mothers are invited, and frequently at least one of the mothers is present. Mark continues to receive speech/language treatment through the school district.

General Classroom Schedule

8:30 - 9:00	Free Time
9:00 - 9:30	Circle Time
9:30 - 10:00	Snack
10:00 - 10:30	Writing Workshop
10:30 - 11:15	Center-based activities
11:15 - 11:30	Circle Time - Review of the day

Free Time: When Mark arrives in the morning, he is greeted by the teacher and instructed to take care of his things and then go play. Mark finds the hook with his name above it and hangs up his backpack. He then finds a puzzle and plays alone. When another child attempts to join him, Mark turns sideways and guards the puzzle pieces with his arm. The teacher encourages the children to play together, and suggests a toy for the two children to play with. Mark participates readily in a bowling game and takes turns as long as the teacher is present. Once the teacher turns to other children, Mark takes the ball when it is not his turn. When another boy wrestles the ball away from Mark, he kicks the pins over. Mark is asked to find a quiet game and returns to his puzzles by himself for the rest of free time. Five minutes before circle time, the teacher announces that it is almost circle time and everyone needs to put their toys away.

Circle Time: Carpet mats are arranged in a circle with the name of each child written on a large piece of tape in the corner. Mark finds his mat and sits down. Circle time begins with conversation time and each child is encouraged to share news from home. The teacher writes a sentence from a number of volunteers on a big chart. She points out the letters and sounds as she writes and later reviews the news. Mark raises his hand with the other children. Mark attempts to share a few words, consisting mainly of vowels which neither the students nor the teacher understands. The teacher asks Mark if his mother sent a note in his backpack. On days that he has a note, Mark runs to his backpack and gets out the note. The teacher reads the note to the class and asks Mark yes/no questions about his news. If Mark does not have a note, he typically repeats his vocalizations once and the teacher tries to ask yes/no questions. Following news, the class gets involved in a few songs with gross motor activities. Mark does not attempt to sing along, though he performs all the actions. Circle time concludes with the teacher reading a story or poem. Each child gets a turn to point to words or pictures. Mark raises his hand appropriately and points to the word as directed.

Snack Time: The teacher announces that it is snack time and she gets out the "helper" board. Three students are assigned to get out items, one to help put food away, and two to wipe tables. Mark is assigned to wiping tables. Once jobs are assigned, the students are told to get their place mats and find a chair at one of four tables. The helpers pass out snack. Mark takes his snack from the helper and eats quickly, stuffing his mouth and allowing food to drool out the side of his mouth. A boy notices, points to him and says, "Look at Mark!" and all the children laugh. Some days, Mark responds by yelling at the instigator or crying. Today, he laughs and adds more food to his mouth to make an even greater mess. The teacher responds by removing his snack and Mark drops to the ground and sulks beneath the table.

Writing Workshop: As students finish their snacks, the helpers clean up the tables. Mark does not get to wipe tables because he is sitting under one of the tables. Papers are passed to each student. A container of markers, crayons and pencils is placed in the center of each table. Mark's snack area is cleared and replaced by a piece of paper. The teacher goes around to each table to give support in writing a story. Some children draw pictures and the teachers label them while other students write letters and scribbles. Mark eventually sits up in his chair and writes MMMMMMMMM all over his page. The teacher stops by Mark and asks him about his story. Mark points at the letters on the page and vocalizes. The teacher cannot discern his meaning and offers vague praise for participating.

Center-Based Activities: The teacher announces that writing workshop is over and the stories are collected. She tells the children that the stories will be taped up on the wall for everyone to see tomorrow morning. The aides had arranged centers for art, math, language (listening and alphabet) and fine motor while the children wrote their stories. The four snack tables are quickly pushed together in groups of two for math and art activities, with the teacher placing large cards at the head of each table. As she places the cards, she tells the students what will be available at each center. The teacher then walks over to the language area and places the card next to the books and record player as she describes the language center for the day. Finally, she places the "fine motor" center card over the 2 computers. Each card has slots for four name tags. The children are allowed to choose the center they want, provided there is enough space. Mark finds his name tag and heads for the computers. Two chairs are set up at each computer and another child joins him. They both reach for the mouse. Mark grabs the mouse away and pushes the other child. A teacher aide intervenes and starts a memory game. She stays long enough to make sure they are taking turns. The other child gets tired of the computer and moves on to another center. Mark stays at the computer until the teacher asks him to move on so another child could use the computer. He very slowly lets go of the mouse and moves over to the math center. Mark arranges plastic numbers in order and uses these to answer counting questions. Center time is over and the teacher calls everyone back to circle.

Circle Time: The children find their mats again and sit in a circle. The teacher invites each child to share 2 things he/she did during the day. For each child, she writes one sentence on an easel. When it is Mark's turn, she looks at the teacher's aides and then at his first computer partner. The child describes the memory game he played with Mark and Mark nods his head. Once everyone's sentences are written, the children are released to find their backpacks and play outside until their parents come or the buses are ready to take them home.

Discussion Questions

1. What do you see as Mark's communicative strengths?
2. What are his weaknesses?
3. What activity could be easily adapted with low tech strategies for communication?
4. What high tech communication strategies might be appropriate for Mark?

Student: Mark

COMPREHENSIVE TECHNOLOGY SUPPORT PLAN

Daily Schedule	Individual Objective	Materials/ Technology	Intervention Strategies	Peer Involvement
Opening Group	will share news from home with minimum assistance	BIGmack	send BIG mack home for Mom to record	take turns sharing; ask yes/no questions
Structured Freeplay	will play interactively w/peer for >10 minutes	symbol boards, Hawk	teach play routines, scripts for cars and cooking	learn play routines; wait for Mark to use symbols
Small Groups	will work cooperatively w/peer to achieve a goal	switch adapted mouse	limit 2 children to computer; 1 with mouse & 1 with switch	peer operates mouse or switch
Transition				
Outdoor Play				
Snack	will eat snack with his peers	None - will raise his hand for more food	give small amounts of food at a time	snack helper passes out small amounts
Storytime	will participate in story reading and story construction	symbols and puppets	choose stories with repetition and roles for children	choose various roles; take turns

Case Study 2

Joshua is a 4 year, 10 month old nonverbal child who has a primary diagnosis of Autism. He has not been tested successfully on standardized measures, but rather by parent report based on his behaviors at home. He has shown global delays with his lowest scores in receptive and expressive language skills. He has attended an integrated preschool program through his school district since he was 3 years old. The classroom consists of six children who have special needs and four typically developing students. Joshua receives speech/language therapy, occupational therapy and physical therapy through the school district.

General Classroom Schedule

8:30	-	9:00	Outdoor Play
9:05	-	9:30	Snack
9:40	-	10:00	Circletime
10:05	-	11:05	Center-Based Activities
11:05	-	11:30	Storytime and Closing

Outdoor Play: When Joshua's father drops him off in the mornings Joshua runs, on his toes with his hands flapping, to the sensory table. He sees what is in the table and then goes to the sand box to seek out his favorite shovel. He takes the shovel to the sensory table where he holds it with an upward palmar grasp as he scoops beans on the shovel and then shakes them off. Joshua occasionally throws the beans in the air. If there is water in the sensory table, he gets either sand or rocks to put in it as well. If the sensory table is not available, Joshua does this same routine in the sand box or pounds a long narrow object, such as the shovel, on the walls surrounding the playground. With physical assistance from an adult and much protest from Joshua, he can be redirected to climb three stairs and either run or hop down a large wedge which is propped against them. He will take an adults' hand for assistance once he gets settled into the activity. Teachers are unsuccessful at helping Joshua climb on the play equipment, ride tricycles or ride in a wagon. He enjoys swinging, although he prefers to swing on his stomach. The staff announces when there are five more minutes to play until snack time and then a transitional song is sung when the five minutes are over. Joshua requires physical assistance to begin the transition, although once he is on his way to the cafeteria he walks and tolerates an adult holding his hand.

Snack: Once the class arrives at the cafeteria each child is given a squirt of soap and asked to wash their hands in the sink. Joshua requires full physical assistance; an adult has to hold out his hand, apply the soap, turn on the water, rub his hands together, hold him as she gets a paper towel, dry his hands, and help him throw the paper in the trash. She then has to hold his hand, open the cafeteria door, and then let him go in. Occasionally Joshua requires assistance to sit at a table, although generally he will go to the tables wsince a teacher is already setting out the snack. Joshua makes vocalizations as he waits for his snack and he will occasionally put his face close to his neighbors'. Once he receives some snack, he will use either his fingers or a spoon, whichever is appropriate for the food eaten. When he begins to finish a particular item that he likes, Joshua reaches to his neighbor's plate and takes some of his snack. After a protest by the child whose food was taken, and help from an adult, Joshua will be given more of the food he likes. When Joshua begins to play with his food rather than eating it, an adult will tell Joshua that it looks like he is finished and then provide hand over hand assistance to throw the remaining items in the trash. Joshua then is taken over to an area on the floor where the children gather when they are finished and sing songs while they wait. Once everyone is finished, they are told to get a friend's hand and begin to walk to the doors. An adult needs to take Joshua's hand and lead him to the door and then to the classroom. He generally is okay with the transition back to the room.

Circletime: Once the class arrives back at the classroom a transition song is sung, indicating that it is circletime and everyone needs to sit on a mat. When Joshua arrives back in the classroom he begins to cry and drop himself on the ground. A teacher will physically help him to the circle area and sit behind him as he continues to protest. Morning songs are sung, helpers are chosen, and attendance is taken. Joshua begins to put his face close to the faces of his neighbors, who in turn push him away. Joshua begins to laugh and is repositioned by the teacher behind him. He is physically helped to participate in the finger plays and activities conducted during the circletime. At the conclusion of the circle activities, Joshua is expected to choose a place to play from a board containing photos of options. He is given hand over hand assistance to choose and is then a song is sung while he puts his mat away. Again, hand over hand assistance is provided. The teacher who was sitting with him then leads him to his "chosen" activity.

Center-Based Activities: Joshua seems to know where there are objects around the classroom that are long and narrow, which he can carry around with him. He immediately finds one, such as a hammer, and begins to pound it on the walls or on tables. He will also begin to walk around the room in a set pattern; i.g., behind the mirror in housekeeping, behind the table in the circle area, by the shelves dividing the manipulatives area, through the book area, and then in and out of the furniture in the housekeeping area. He repeats this pattern until he is physically assisted to an art activity, computer activity, or other structured task. When he is taken to another area, Joshua vocalizes protest, pulls away from the adult and generally fusses until he is helped to complete some portion of the task with hand over hand assistance and then let go again. Joshua walks around the other children apparently without wanting to join their activities. Again, a song is sung, indicating that it will be clean-up time in five minutes. After five minutes, a song regardin clean-up time is sung. Joshua is helpd hand over hand to put away the toy which he has been carrying around. He fusses, cries and drops to the floor when it is taken out of his hand and put in the proper place. He is then led to a carpeted are where a teacher will read a story pertaining to the theme of the week.

Storytime And Closing: During the story reading, Joshua is still agitated regarding the transition and the fact that his favorite item to carry was put away. He is loud during the story and the teacher tries to distract him by showing him the book and pointing out pictures. Joshua pushes the book away by kicking at it and crying louder. The teacher continues with the story, a song is sung that pertains to the theme of the week, and a good-bye song is sung. The children are then dismissed to either go home with their parents or bus drivers if they've arrived, or to go outside and wait for their rides. Joshua's mother picks him up each day and generally arrives before the circletime ends. Joshua spots her immediately and gets up to run to her. He is caught by the teacher and asked to wait until the group time has ended. He begins to cry again and throws himself on the ground. He runs to his mother when the teacher lets him go and the group time has ended.

Discussion Questions:

1. What are some ways you could adapt play for Joshua during outside time?
2. How could you enhance Joshua's interest and participation during circletime?
3. What are some toys/activities you could introduce to Joshua during center-based activities? How could you adapt the toy/activity if needed?

Student: Joshua

COMPREHENSIVE TECHNOLOGY SUPPORT PLAN

Daily Schedule	Individual Objective	Materials/ Technology	Intervention Strategies	Peer Involvement
Opening Group	J. will look at the speaker when his name is called to move his picture from home to school	Printed name and photo on a sentence strip	Sing J.=s name and hand him his picture	Each child models the routine
Structured Freeplay	J. will choose a toy to play with from a choice of two and play appropriately for one minute.	Photos Choiceboard	Modeling Verbal Prompts Physical Assistance Imitation	Peers will model matching the picture to the toy and also how to play with each toy.
Small Groups	J. will attend an art activity two times per week when he is shown schedule indicating art.	Symbols depicting classroom schedule Art mediums	Modeling Verbal Prompts Physical Assistance	A helper will turn each picture over to indicate when the activity is completed.

Transition	J. will transition from snack to large group when given an object cue, a symbol cue, and minimal verbal prompts	Instrument as an object cue. Circle time symbol.	Modeling Verbal Prompts Physical Assistance	Each child gets an instrument and is cued to go to large group.
Toileting	J. will pull down his pants during the routine	Symbol board for toileting, including pulling pants down.	Verbal Prompts Physical Assistance	
Outdoor Play	J. will explore various outdoor activities and equipment with minimal physical prompts when given two choices.	Photos of toys/activities Choiceboard Toys/equipment	Modeling Verbal Prompts Physical Assistance	Peers will model choicemaking using photos and will follow through.
Snack	J. will request more food by activating a BIGmack with the request programmed.	BIGmack Symbols	Modeling Verbal Prompts Physical assistance	Peers will model choicemaking using photos and will follow through.
Storytime	J. will use a Talking Rocking Switch Plate to indicate the repeated line.	Talking Rocking Switch Plate Symbols	Modeling Verbal Prompts Physical assistance	Peers will model use of the switch when cued by staff.

Case Study 3

Sara, a six year old girl, is fully included in a typical first grade class. Her learning is challenged by the effects of spastic-athetoid cerebral palsy which have compromised her motor and expressive communication abilities. She receives OT, PT, and Speech Therapy services using an integrated model. Although her speech is dysarthric, she can make herself understood most of the time. Mild drooling occurs when she is excited or concentrating on a task. Sara is very social and friendly, and displays a good sense of humor. Cognitvely and receptively, she is felt to be functioning at close to chronological age level, but she is difficult to accurately test with standardized instruments due to motor deficits. She is highly motivated for most school-related tasks, but can be willful and stubborn at times, particularly when tired or frustrated.

Opening: When Sara arrives at school, she is met at the bus by Donnie, her one to one classroom aide who wheels her in her manual wheelchair to her classroom. On most days, Sara has a big smile and says "hi" as she greets her teacher and peers. Donnie removes Sara's "passport" message pad from her backpack. The passport is used to convey messages between school and home. When it is Sara's turn for "sharing", at the start of the school day, her mother will usually include her item in the backpack along with a brief description of why Sara wants to share it with the class. Donnie attaches this note to Sara's vertical eye gaze panel. When it is her turn, Sara describes what she has brought. She likes to bring in stuffed animals and "My Little Pet Shop" figurines. Sometimes these are also attached to the eye gaze panel in order to keep them out of the way of Sara's jerky arm movements. When she has difficulty forming some of the words to describe the items, Sara looks at the note. Donnie reads the note and helps clarify, using yes/no questions.

On the other three days, the opening morning activity is journal writing. At the current time Sara is physically unable to maintain an adequate grasp on her crayon or pencil necessary to form recognizable letters. Her head control is good, but Sara has significant motoric impairments in all four limbs due to increased muscle tone and random, poorly controlled movements of her arms. This severely restricts her fine motor coordination. She prefers to use her right hand, but purposeful arm and hand movement consists of inconsistent gross grasp and release. Her thumbs are usually adducted (kept tucked into her palms). Therefore, she is very restricted in her ability to manipulate classroom materials and age appropriate toys. However, Sara is beginning to develop the ability to isolate and point with her right index finger. Donnie uses a combination of Sara's dictation, the messages in the passport, and Sara's yes/no responses to her questions to write messages for Sara in her journal.

Morning Activities (Language Arts): The rest of the morning is devoted to reading and language activities. Sara participates in large group activities orally and completes written assignments by telling Donnie what to write. Sara and Donnie also use this time to work on individual skill development. This typically includes working on fine motor skills and coordination: picking up raisins, placing pegs, stacking cones, practice pointing to items with her index finger, etc.

Snack / Recess: Halfway through the language arts program, the class takes a break for snack and recess. Donnie feeds Sara the cookies or crackers that her mom provides. Sara has no significant problems with chewing and swallowing - unless she is having an "attack of the giggles." She will suck through a straw when the cup is held for her. When the rest of the class goes outside for recess, Donnie takes Sara to the bathroom. She transfers to the toilet using a partial standing pivot transfer. Sara is potty trained, but does have occasional accidents when her toileting schedule is not closely adhered to. If there is time left, Sara joins her class out on the playground until the end of recess.

Morning Activities: After recess, the class continues with the reading and language activities they had begun earlier. Sara either joins a group or works with Donnie on individual objectives.

Lunch: Sara goes to lunch with the class. Donnie helps feed her and then takes her to the bathroom again. When finished in the bathroom, Donnie takes Sara outside. A friend helps push Sara around the playground while Donnie goes to lunch.

Afternoon Activities (Math, Specials, Science, Social Studies, Art): When the class returns from lunch, Sara is taken out of her wheelchair and placed in a prone stander for positioning needs. As the class is now involved in math activities, Donnie will place the items on the stander's laptray and she then provides hand over hand assistance. When Sara startles in response to very loud noises, the items fly all over and Sara and her classmates all laugh.

Sara joins her classmates for the afternoon recess session and especially enjoys the specials of music and PE. The last half hour of the day alternates between science, social studies, and art - which she thoroughly enjoys. The latter is accomplished with much adult intervention and hand over hand assistance.

Discussion Questions:

1. What are two ways that the use of computers could be incorporated into Sara's day to promote greater independent participation in the curriculum?

2. What light tech approaches to access might be tried?

3. Which high tech access techniques might be helpful to her?

Student: Sara

COMPREHENSIVE TECHNOLOGY SUPPORT PLAN

Daily Schedule	Individual Objective	Materials/ Technology	Intervention Strategies	Peer Involvement
Opening Group	will share information from home	passport; words & letters on eye gaze frame	Design words to help when communication breaks down	Peers will ask questions when communication breaks down
Language Arts	will participate in creating stories, rhymes, poetry	track ball w/keyguard; Ke:nx setups with words; symbols on computer; IntelliTalk	position arm; create setups; demonstrate features and allow Sara to work independently	work in small groups; take turns writing one word on computer in round robin
Lunch				

Math	will add single digits	adapted track ball; Millie□s Math House	(same as above)	one peer works with Sara; boots up program & takes turns
Science	will participate in Science unit w/minimal assistance		(same as above)	(same as above)
Art	will create drawings with minimum assistance	track ball; KidPix 2	(same as above)	(same as above)
Music				
PE				
Toileting				

Case Study 4

Maria is a four-year-old girl who lives at home with her mom, a little sister, her aunt and her cat, Leigh-Leigh. Maria attends a preschool class for students with and without disabilities four mornings per week. She enjoys school and especially loves music. Maria is diagnosed with static encephalopathy and developmental delays. Her speech is unintelligible to everyone except her mom, who understands occasional words. Maria is scheduled for an augmentative communication evaluation in two months. In the meantime, her mom and speech-language pathologist have set her up with an on/off switch, the Plate Switch with Latch (Enabling Devices) connected to a 30-second loop tape on an adapted tape player. They chose an on/off switch because Maria was having difficulty holding down an switch to activate the message. Now she presses the switch to speak a message, then presses it again when the message is completed.

The school team met with Maria and her mother to plan for ways to use a switch at home while waiting for an augmentative communication evaluation. The school staff identified needs for Maria to learn how to activate the switch with proper timing and to use messages functionally. Mom was looking for ideas to help Maria play with her little sister, Veronica. The following paragraphs provide examples of how it was agreed Maria could use assistive technology at home.

Waking Up: At night, Maria's Plate Switch is velcroed to her night table, with the tape player attached. On the tape are recorded a variety of wake-up messages (MOMMY, I'M UP! . . . YOO-HOO, I'M AWAKE . . . MOMMY, I WANT TO GET UP NOW. . . GOOD

MORNING, MOMMY). Before she had this, Maria used to cry and scream until her mom came in. She is learning to push the switch to call out one message, then wait a minute before calling again. Just like her little sister, Maria has to learn through experience not to wake up her mom at night unless it's pretty important.

Breakfast: Requesting More: After several trials, Maria's mom helped her little sister record MORE PLEASE on a tape, and Maria uses her switch to control the message. That way, Maria can control the speed with which her mom or aunt feeds her breakfast.

Mealtime: Saying Grace: At Maria's house, each family member takes a turn to say the grace. When it is Maria's turn, her aunt gets the loop tape marked "Grace" and puts it in the tape player. Maria uses her switch to lead her family in the grace.

After Dinner: Feeding the Cat: Maria's favorite time of day is feeding Leigh-Leigh. Maria's Mom is trying to teach her little sister to help operate the loop tape system. Veronica holds up two loop tapes, one with a picture of a story book, and one with a picture of a kitty. Maria vocalizes and reaches toward the loop tape with the kitty picture. Her mom helps Veronica to put it in the tape player. Then Veronica opens the door, they turn up the volume on the tape player, and Maria presses her switch to call "HERE KITTY, KITTY, KITTY."

Play: Using switch toys: Maria has a number of switch toys which she can operate with her switch and timer. One of her favorites is a skating doll. She enjoys playing with this toy laying on a bean bag chair in the den (which happends to have a wood floor). Veronica helps Maria lay out doll items on the floor. When Maria pushes the switch, the doll starts skating down the line of play items. When she hits the switch again, the doll stops next to an item. Veronica either picks up the item to play with or fastens it to the hand of the doll.

Using the tape recorder: Maria also uses the switch plate to play music on the tape recorder. To help Maria practice starting and stopping, her aunt and her sister play "freeze" when the music is stopped. Sometimes they end up in very funny positions.

Student: Maria

TECHNOLOGY SUPPORT PLAN FOR HOME			
ROUTINE	**OBJECTIVE**	**MATERIALS**	**STRATEGIES**
Waking Up	Maria will tell Mom when she is ready to get up	Switch within reach by the bed. Loop tape with "I'm awake" messages	Mom will make a lot of noise in the kitchen while listening for Maria's call.

Breakfast	Maria will tell her mom or aunt when she is ready for more food	Switch with "more please" message on loop tape	Mom (or aunt) will wait to give another bite until Maria has asked.
Mealtime	Maria will say table "grace" when it is her turn	Switch and "grace" message on loop tape	Family will wait 3 seconds; Mom will remind verbally; Veronica will pick up her hand and help her.
Chores	Maria will help feed the cat	Switch and "Leigh-Leigh" loop tape	Veronica will help record a message, turn up the volume on the tape player and open the door.
Play	Maria will play interactively with Veronica	Switch, switch toys, tape recorder & music	Veronica will learn play routines for switch toys. She will help set up choices for Maria. Will play "freeze" when Maria stops the music.
Bedtime	Maria will call Mom only when it is urgent	Switch & loop tape with "I'm awake" messages	Switch positioned by bed. Maria is scolded if calls unnecessarily.

VIII.

ASSISTIVE TECHNOLOGY AND FUNDING

ASSISTIVE TECHNOLOGY AND FUNDING

There are many challenges associated with providing assistive technology products and services to children with disabilities, and funding is often considered to be a major barrier to the implementation of technology in the classroom. The authors of this manual feel strongly that funding should not drive the technology selection process, but acknowledge that it is a factor not to be ignored; a payor source must always be determined if a child is going to actually receive a piece of technology. Funding assistive technology is very complex and involves issues which are beyond the scope of this manual. However several points will be addressed.

While it is not the classroom teacher's obligation *to obtain funding* for a child's device, teachers and therapists who are knowledgeable about funding can be an excellent resource for parents seeking technology or other services for their children with recently diagnosed disabilities. Teachers must also have a basic understanding of the responsibilities of school districts to provide assisitve technology to students. It is extremely important that teachers do not give incorrect or inappropriate information to parents. Misinformation has the potential to spark adversarial situations which are often counterproductive to the child's needs.

School districts are obligated under the law (P.L. 105-17, IDEA) to provide - at no cost to the parents - assistive technology devices and services when they are:

- Necessary for the child to receive a free, appropriate public education (FAPE).
- Determined on a case by case basis by the IEP team according to the results of a comprehensive multidisciplinary evaluation. If the school district does not have qualified personnel to perform an assistive technology assessment, or if the parents disagree with the results, they are entitled to an independent evaluation at the school district's expense.
- Documented as part of the child's IEP or IFSP. According to Golinker and Mistrett (1997), the IEP must include a specific statement of AT devices and services, including the nature and amount of services.

Teachers should also be aware that:

- School boards cannot establish policies presumptively denying AT services to students. In other words, a teacher or administrator cannot legally say that the district does not provide assistive technology devices. Nor can school boards alter the statements on the IEP regarding special education and related services.

- AT devices provided for the child by the school district can be used at home if their use is required to implement the IEP as part of FAPE.

- Eyeglasses and hearing aids are considered AT devices. When the child with a disability requires these aids to receive FAPE, and it is specified on the IEP,the school district must provide them.

- Following the IEP committee's approval of devices and documentation on the IEP, the school district is required to obtain all listed AT services and devices.

- Thirty days is considered a resonable timeline to have AT services and devices in place.

OTHER POTENTIAL FUNDING SOURCES FOR ASSISTIVE TECHNOLOGY

Although school districts are becoming a significant funding source for educationally necessary assistive technology, they are not the only resource for students with disabilities, if the technology is medically necessary. Depending on the specific eligibility criteria (Menlove, 1996), the child - or in some cases, the school - may be able to receive funding from:

- Medicaid

- Medicare

- State Agencies
  - Developmental Disabilities Programs
  - Division of Services to the Blind/Deaf
  - Vocational Rehabilitation Services
  - State Tech Act Programs
  - Children's Medical Services

- Private Health Insurance

- Independent Living Programs

- Disability Agencies
  - Easter Seal Society Inc.
  - United Cerebral Palsy
  - Muscular Dystrophy Association, etc.

- Community Service Organizations (Lions, Kiwanis, Elks, Shriners. etc.)

- Special Purchase Programs Through Vendors
- Private Donations /Family Contributions
- Public and Private Grants

DEVELOPING CLASSROOM FUNDING THROUGH MINI-GRANTS

The mark of a successful augmentative communication workshop may be the degree of despair it invokes in experienced clinicians, due to the increased amount of time, energy, and monies that will be needed to implement the strategies suggested. This reflects the sometimes overwhelming amount of support required for augmentative communication programs. Various forms of support may be necessary, such as: securing funding for needed equipment, adapting play materials, building equipment, developing or duplicating communication displays, and programming devices. Even the most dedicated professional cannot find the time and expertise to complete all needed tasks, while preserving sufficient time for direct services. Musselwhite (1991*), Developing Mini-Grants and Utilizing Nontraditional Volunteers*, may help meet these challenges.

Developing Mini-Grants

While clinicians are increasingly participating in the arena of grant-writing, many direct-services individuals may be overwhelmed by the time and expertise required to write and administer a full-fledged grant. This section will address the use of mini-grants as a time-efficient strategy to gain funding while simultaneously developing grant-writing skills. A *mini-grant* is defined as a relatively brief and straightforward document sent to local or regional service organizations or foundations, for the purpose of funding a specific piece of equipment or a project. A sample mini-grant can be found in Appendix B. A simple mini-grant process can be used to yield increased funding with a minimum amount of time and effort:

A. Select Appropriate Equipment or Projects for which funding is requested

   1. Choose and describe specific pieces of equipment (e.g., speech output device, microcomputer); add supportive information such as vendor brochures

   2. Choose and describe specific projects (e.g., setting up a toy lending library or adaptive cooking program)

B. Identify Potential Funding Sources

1. Sample funding sources

   a. Service organizations are excellent targets (e.g., *Lions, Rotary International, Civitan Sertoma, Seroptomist, Knights of Columbus*)

   b. Local/regional foundations (contact the librarian of your local college for assistance in locating appropriate foundations); *The Foundation Center* (79 Fifth Avenue, New York, NY 10003) is an excellent resource for learning about available funding sources

   c. Support groups for your organization (e.g., auxiliary for hospital, parent-teacher organization for school)

2. Contact the local Chamber of Commerce for addresses of area service organizations and names of contact people

C. Develop a Basic Cover Letter

1. Include the following information:

   a. Identifying information

   b. Tie-in to the target organization

   c. A brief summary of the request

   d. A comment on the impact of the project/equipment

2. Offer to give a presentation to support your proposal

3. Take the time to use a word processor to tailor the letter to the needs and interests of the group; for example, the mission of *Seroptomist* is to assist persons with communication impairment, and the motto of the *Society for Preservation of Barbershop Quartets in America* is "We sing so that they might speak." This is information you can use in writing proposals.

4. Make reference to enclosures, which provide the "meat" of your proposal

D. Write a *Mini-Grant* to Send to Each Target Organization, or Modify Mini-Grants provided by Musselwhite (1991).

1. For the purpose of this chapter, a *mini-grant* is defined as a brief funding proposal to be provided to an organization, whether solicited or unsolicited.

2. For maximum success, the mini-grant should include the following:

a) Abstract Page: This should summarize the need, the scope, and procedures for accomplishing the project. Reference should be made to additional information, which will be included in appendices.

b) Target Population: A description of the individuals who will benefit from this project, including specifics. Information on the host facility may also be included, indicating why it is an appropriate site for the project.

c) Project Objectives and Expected Benefits: This should describe outcomes of the grant in specific measurable terms. The listing of specific benefits should be based on a framework (e.g., domains such as social skills or, expressive communication, or academic areas such as math or science).

d) Budget/Description of Equipment Requested: A clear budget should be outlined, with a concise description of each piece of equipment requested. Specific ways that equipment will be used should be delineated.

e) Evaluation and Dissemination Plan: This will help determine the degree to which objectives are met and a procedure for reporting back to the granting agency. For some projects, information gained will be shared with other professionals. While extensive dissemination plans are beyond the scope of mini-grants, it is feasible to indicate plans to share information via strategies such as giving a presentation at a local or regional conference. In addition, this section might indicate how an announcement of the project can be shared with the general public (t.v., newspaper), thus giving positive exposure to the granting organization.

f) Summary of Expertise of Grant-Writer: A brief resume should be appended, highlighting information relevant to the grant request; for example, if requesting computer equipment, a summary of recent microcomputer workshops attended would be appropriate.

IX.

ASSISTIVE TECHNOLOGY AND TEAM TRAININGS

The success of an early intervention program is based largely on the knowledge, experience and cooperation of a team of dedicated individuals. As indicated previously in this manual, assistive technology intervention is an area that requires cooperation among team members of various disciplines. When learning new information, each member of the team will process the components differently. It is important to meet regularly and carefully plan for changes in the classroom. In order to successfully integrate technology into the curriculum, changes may need to be made in the classroom environment, activities, schedule and/or teaching strategies. How the team goes about making these changes may play a significant part in determining how successfully assistive technology is used. This chapter will discuss two effective methods for making changes in a classroom: job coaching and professional workshops.

Effective Job Coaching

Job coaching has been used in a number of professional fields to provide opportunities for hands-on learning in an appropriate environment. In the case of assistive technology, teachers and students can see how a specific piece of equipment will work in their classroom. In addition, strategies for appropriate use of that equipment can be modeled.

> Mrs. Smith, the classroom teacher has expressed concerns about Jenny's participation in circle time activities. The assistive technology trainer arranges her schedule, so as to be able to watch as the teacher leads circle activities. Each student has an opportunity to identify his name as the other students sing "good morning" to him or her. It is apparent that Jenny, who is nonverbal, does not have a way to sing the "good morning" song with the other students. The trainer quickly finds a BIGmack and records part of the chorus of the song as the students sing. She then demonstrates how to cue Jenny by offering the device at appropriate times in the song. After circletime, the children move into freeplay. The trainer then shows Mrs. Smith and one of the aides, Mrs. Pam, how to record the message. They agree that the next day the trainer will observe and give feedback while Mrs. Pam presents the device to Jenny.

A number of things happened in the above example that will help this classroom team:

1. *The trainer responded to a need identified by the teacher.* Suggestions are much more likely to be implemented if they related to an identified need.

2. *The trainer observed the activities occurring in the current setting.* An effective job coach does not enter a classroom with the intention of changing everything that is happening. She is observant of teacher and student styles of interaction. She watches the activities and attempts to suggest strategies that will enhance what is happening in the classroom before recommending new activities.

3. *The teacher and her aide indicated an interest in learning how to program the device.* In order for job coaching to be effective, all participants must be motivated to learn new skills.

4. *The strategy suggested did not significantly change the structure of the activity.* The classroom aide typically assists the children during this activity. She was available to offer the device to Jenny at the appropriate time. If she had not been available, the team would have discussed possibilities for other adults or children to act as facilitators.

5. *Small changes were recommended.* A number of other observations could have been made during this activity and the transition into the next activity. It is important that we begin by making suggestions for small changes, such as offering the repeated line of a frequently used song on a BIGmack. Other small changes could include positioning students or materials differently, adding symbol support for one song, using an adapted tape recorder for the transition music. Larger changes could include incorporating the use of communication stimulation boards, adapted positioning/mobility equipment, or choice boards. An effective job coach will allow the trainees to feel comfortable with new equipment during familiar routines and activities. As the trainees become more comfortable with the technology, they will come up with more ideas of how to use it. It is the responsibility of the job coach to help shape these ideas into strategies that fit best practices.

6. *Support and feedback is ongoing.* The participants agreed that when the trainer returned, the aide would offer the device to Jenny. This offered a specific opportunity to train a learned skill (programming the BIGmack) during a meaningful activity. It also gave the trainer the opportunity to observe and provide feedback on additional skills needed in order to be successful. She can talk about fading prompts to encourage independent device use (Table 1-8), positioning the device for access and ways to coordinate timing and pauses as necessary.

Designing Assistive Technology Workshops

The information in the following paragraphs includes a compilation of personal experiences, trainings in adult learning strategies (conducted by the training team at Southwest Human Development) and various resource books for trainers. Trainers are encouraged to look at the resource list at the end of this chapter in order to find ideas about how to make trainings interesting and interactive.

Getting to know your audience

Conducting a basic needs assessment will help you to plan trainings. Try to find out the number of participants, their roles and tasks, their familiarity with assistive technology and each other, their attitudes and beliefs, and their expectations. A pre-training survey can be an effective tool when properly used (see Appendix C). Most importantly, ask if they have any "burning questions," or immediate needs for specific training. Think of learning outcomes that range from a level of awareness and knowledge to practice and application. Not everyone in the audience will be ready to apply the information presented at the first training. We have also found it helpful to ask people to identify themselves with a Technology Profile. These profiles include the Techno-Phobic (afraid of technology), Techno-Weenie (knowing a teeny-weenie bit about technology), Techno-Wannabe (knowing something about technology and wanting more) and Techno-Ace (knowing quite a lot and ready to apply new skills). During trainings, be sure to provide opportunities for participants to interact with the trainers, presenters and with each other. Hopefully, participants at various levels of learning will help each other.

Possible Workshop Topics

- Engineering the Classroom / Home Environments
- Introductory AAC devices
- Technology across the curriculum
- Writing functional goals
- Adaptive Play & Switch Construction
- Introduction to scanning
- Seating & Mobility
- Computers and Early Childhood
- Handwriting, Literacy and AAC
- Adapting the Arts
- Grant writing and using volunteers
- Advanced level AAC devices
- Low vision issues in AAC

Plan Your Presentation

- Outline training objectives.
- Make an agenda - alternate between lecture and small group or hands-on activities (provide extra time for re-grouping).
- Consider adult learning strategies as described in Table 5-1.

Prepare Presentation Materials

- Keep overheads simple - use at least 24 pt font
- Use only quality videos, and then for brief periods
- Provide clear written instructions for hands-on activities
- Number your hand-out for easy reference
- Practice activities that involve equipment
- Make sure all devices are charged
- Provide participants with some type of brainstorming page or back home plan for applying new skills

Conduct the Workshop

- Allow participants to share their knowledge and experience
- Provide sufficient time for breaks
- Be clear when giving instructions
- Try to keep to schedule as much as possible
- Address all questions, even if your answer is "I don't know" or "We will have to cover that at a future workshop."

Tips for Presenters

- Start each workshop with an icebreaker
- Make sure the icebreaker relates to the topic
- Provide lots of examples
- Bring any resource books that you have
- Use only short videos for specific purposes
- Include hands-on opportunities with materials and equipment
- Have a project as a make-it, take-it for each workshop
- Include case studies and discussion questions

Provide Opportunities for Feedback

- Feedback forms for individual workshops (Appendix C)
- Satisfaction forms for entire training series
- Tracking forms for individual students

ADULT LEARNING STRATEGIES

We have used a variety of strategies, depending on the topics covered. Table 5-1 provides the reader with advantages, disadvantages and pointers. The next section includes brief examples of how you could use each strategy during trainings specific to assistive technology, and ends with a sample workshop.

Demonstration

This method is used frequently to show participants how to use computer programs, program devices, or adapt toys. Demonstration is also helpful when you want participants to see the final product before they start a make-it, take-it project. Please note the disadvantages and pointers in Table 5-1. Of particular importance is the idea that you need to do careful preparation in order for demonstration to be used successfully. When we are going to demonstrate how to program a device, we make sure the device is charged and working and we have appropriate overlays completed and organized. Frequently, we follow-up with small group activities, where we provide written instructions on what we demonstrated, start simple (learning how to record on a device before programming multiple levels), and provide support and feedback both during and after the activity.

Group Discussion

Group discussion can be used to address a variety of topics in assistive technology.

You may want to begin with ideas that are familiar to the participants. A topic which frequently results in group discussion is the use of various symbol sets and color coding strategies. Questions may include "What type of symbols are you currently using in your classrooms?" or "What experiences have you had when using various symbol sets?" Typically, we include information on the saliency of the symbol when the background is colored, the ease of copying and reproducing overlays with black and white symbols, and research about how the use of AAC does not stop children from speaking.

Group Inquiry
This method encourages the participants to ask questions. The topic of symbol sets suggested for group discussion may also result in group inquiry. Be sure to be prepared. Another way to use group inquiry is to ask participants what concerns they have about a particular student in their classroom. Ask one person from the team to provide a brief overview of the child and the concerns they have. The group as a whole can then brainstorm possible strategies to help that teacher.

Guided Learning
We sometimes use guided learning in constructing overlays. Ask the participants for ideas about what activities occur frequently in their classroom. We like to use hand washing. Then have the group brainstorm 36 words that have to do with that activity. Continue with the steps for constructing an overlay, listing words by importance, organizing into parts of speech and placing on a grid. Guide them to include various parts of speech and comments. Then you can put up an overhead of the washing overlay used by Goosens', Crain & Elder (1994) to compare.

Spot Challenge
We use spot challenge to review functions or features of various devices. Keep in mind that this may be a difficult task if participants have had little time to practice with the equipment. Try challenging people on things they do everyday, or ask for volunteers. During a brainstorming activity for creating vocabulary displays, you might try throwing a koosh ball to a participant and ask him/her to give one word related to the activity. The koosh ball can then be thrown to another participant, and the brainstorm continues. Be sure to acknowledge answers and provide feedback in accordance with your goals. In the vocabulary activity, write down words and then compare to pre-made displays for the activity.

Observation
We ask the participants to videotape their own classrooms. The Quality Indicators were used as a checklist to focus their observations and discussion. However, these videos were not used in large group workshops where teams would be observing each other. Be careful about analyzing performance in front of other people. Remember that participants need to feel comfortable with others observing them in a non-threatening environment. We also find that job coaching provided participants with the opportunity

to observe us interacting in their classrooms with their students. It is helpful to talk about how you planned an activity, what went well, and what you would change the next time. In this manner, the trainees can understand that providing opportunities to access technology is an ongoing evaluation process, full of trial and refinement.

Situation Study

An easy example of a situation study could be one of the case studies from this chapter. However, a good situation study includes demonstration, observation, analysis and discussion. A presenter must know the material, and be prepared to be flexible in discussion. Think of circle time as a situation study. Ask volunteers to demonstrate how they would use a specific piece of technology during circle time. Spend time with the large group discussing what they observed and providing suggestions for improvement. Participants could then divide into small groups and continue. Be sure to provide explicit instructions about the role-play and the operation of the technology.

Small Group Discussion or Activity

A great deal of our workshops involve small group discussions and activities. Most likely, this occurs because we want a hands-on approach, and we know that nobody can learn to operate a piece of technology without actually handling it. When using this method, be sure to provide careful instructions and time limits. Keep the number of groups at a level where presenters can provide assistance, if necessary. However, keep in mind that people in groups of more than eight may have fewer interactions, due to fear of speaking in a large group. Finally, design a method for calling the discussion to an end (e.g., flashing the lights, clapping to a rhythm, raising a hand).

Lecture

When we are providing an overview of assistive technology to a large group, lecture is typically the easiest method to cover a lot of material. However, be sure to include as many other techniques as possible to try to increase learning (visual backup, demonstration, mental imagery, etc.). For example, when lecturing about access methods, we use mental imagery and our own bodies to talk about finding a body part which has reliable movement to activate a switch; we demonstrate how certain devices perform various methods of scanning; and we use overheads to show the basic function of a switch when turning a toy on and off.

Mental Imagery

As mentioned in the previous section, you can use mental imagery to help participants visualize how a student with a particular disability can move his or her body to access a switch. We frequently ask participants to think about their classroom or the students in their classroom as we are presenting information. This helps them to make plans for bringing the information home and using it. We have also provided quick activities and later asked the participants to remember how they felt. An example used during workshops on positioning and access is as follows: Sit on the very edge of your chair and raise your legs so your feet are not touching. Now get a piece of paper and hold it in the air directly in front of you. Now write your name on it, using your non-dominant hand. This helps prep the audience for a discussion of how important positioning can be. You can ask the participants to stay on the edge of their seats for a few minutes and find out which of them feels like they are attending to the lecture. In future workshops, you can use mental imagery to ask them to recall how it felt, without actually repeating the activity.

Read and Discuss

A number of sections in this manual can be used as read and discuss topics: vignettes in the section on curriculum, sample IEPs, case studies and technology integration plans. In addition, a number of resources are suggested for further reading at the end of certain sections. Certain handouts, chapters or articles could be given to participants at the beginning of a training, or in preparation for a future workshop. Keep in mind that participants will get the most out of a passage if they have a purpose for reading.

Visual Backup

Almost every topic we cover in assistive technology requires visual backup. The first thing that comes to mind is the technology itself: communication devices, computers, and switches. Overheads may be used to outline key points or summarize discussion findings. Videos may show examples of students using AT, but be sure they are high quality and pertinent to the topic.

Writing Task

This technique can be used to help participants use what they have learned and to draw their own conclusions. Be careful not to leave this task to the very end of the workshop, or participants may not complete the assignment. We use the Comprehensive Technology Plans as a framework for writing goals for students in their classrooms, based on information shared in a specific workshop. Be sure to provide careful instructions and allow opportunity for feedback and discussion. Table 9-1 is reprinted with permission from SWHD Teaching Center (1995).

Table 9-1. Adult Learning Strategies

DEMONSTRATION: The presenter actually performs or simulates the process

Advantages	Disadvantages	Pointers
Excellent way to learn skills necessary for using equipment, instructional materials, procedures etc. Participants can immediately try out what they have just seen as a demonstration Involves auditory, visual and often kinesthetic (movement) senses with a maximum involvement of the participants	Demonstration must be limited to amounts of information that the participants can learn Ñ don't show too much at one time! Breaking demonstration into learnable "chunks" may be difficult May be difficult to set up the classroom for good viewing by all participants Not very good for large groups unless all participants can see, hear or otherwise participate completely May be difficult to obtain enough materials/equipment. Participants must have follow-up opportunities to practice demonstrated skills soon after demonstration, or the training value is lost	Include a verbal summary either before or after the demonstration Provide opportunity to practice skills on real problem as soon as possible Make sure in advance that materials and equipment are all available for use and in good working order Practice the demonstration beforehand to establish timelines, possible difficulties and anticipate learner questions

GROUP DISCUSSION: The presenter must first build interest before starting a discussion

Advantages	Disadvantages	Pointers
Permits maximum interchange of ideas Permits clarification, sharing of understandings and review of important points Allows participants to acquire and practice interpersonal competencies Participants choose level of involvement based on own degree of comfort	Participants must have basic information on which to build discussion Ñ trainer must lay some content foundation Without focusing, discussions can wander far afield. One or two people may try to dominate the discussion. Can become very time consuming	Time limits and goals must be explicitly set Open ended questions trigger better discussions than close ended questions

GROUP INQUIRY: The presenter challenges participants to devise their own questions

Advantages	Disadvantages	Pointers
Allows presenter to gear teaching to participants needs	Participants must have prior knowledge of material or first be presented with relevant instructional materials, and information	Allow sufficient time for the group to form questions or solve problem You can field questions one at a time or from the entire group

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Table 9-1. Adult Learning Strategies

<table>
<tr><td colspan="3">GUIDED LEARNING: Asking for responses to a series of planned questions</td></tr>
<tr><td>Advantages</td><td>Disadvantages</td><td>Pointers</td></tr>
<tr><td>Taps knowledge of the group or gets their hypotheses or conclusions
Allows presenter to learn what participants already know and understand before making instructional points
Encourages self discovery
Nice break from straight lecturing</td><td>Presenter must have extensive knowledge of subject
Presenter must be skilled at encouraging, and controlling verbal input
Participants must feel they are in a safe environment to take the risk of stating their beliefs.
Extremely verbal participant(s) may monopolize discussion or present inappropriate viewpoints</td><td>Maintain balance between participant and trainer input
Record ideas and compare to the lecture points presenter has in mind
If done in small groups, reconvene groups and share findings</td></tr>
<tr><td colspan="3">SPOT CHALLENGE: Ask participants to give examples of the concepts presented thus far</td></tr>
<tr><td>Advantages</td><td>Disadvantages</td><td>Pointers</td></tr>
<tr><td>Can test participants understanding of material or concepts before proceeding with additional information
Participants have an opportunity to check their understanding</td><td>If group is large, or participants are of varying levels of expertise, not everyone will participate
If a person doesn't understand the concept, their self esteem decreases and they try (usually) to hide the fact that they do not understand</td><td>Concepts or questions may be planned or spontaneous, but make sure they support or clarify what is being presented</td></tr>
<tr><td colspan="3">OBSERVATION: Watching others without directly participating</td></tr>
<tr><td>Advantages</td><td>Disadvantages</td><td>Pointers</td></tr>
<tr><td>This can be a very effective way to experience learning without being a direct participant in the activity
Observers can have strong feelings if what they are observing has personal impact</td><td>It may be difficult to determine ways to make the observation session an active experience
There may not be enough trust among the participants to provide meaningful feedback after the observation</td><td>Try to provide aids to help participants retain pertinent aspects
Before the observation begins, provide an over-view of important aspects
Provide observation forms with suggestions, questions, and checklists</td></tr>
</table>

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Table 9-1. Adult Learning Strategies

SITUATION STUDY: A type of written or scripted demonstration		
Advantages	**Disadvantages**	**Pointers**
Best known way to help participants both experience certain feelings and practice certain skills Participants identify with viewpoints and roles other than their own Encourages problem solving around issues Time saving, learners can experience many different situations in short periods of time Provides opportunities for immediate feedback to learners on their attitudes, ideas, strategies Information usually presented in a lecture can be embedded in situation study information Abstract information can be presented concretely Understanding or lack of it is immediately evident	Participants must be willing and able to get involved Not all participants may get a chance to participate in the role play Time consuming to plan Time consuming to execute Follow-up activity is vital to summarizing experience and making key points A situation study may be difficult to write effectively If information presented is new, content may be difficult for participants to transfer into practice	At the outset, clarify purpose, problem or issues to be addressed Give learners sufficient information about the characteristics of their roles Encourage learners to stay in their roles Encourage learners to watch reactions of other role players Always spend time debriefing to make key points and allow learners to share their views Presenter should always do the first role play, and state "never ask someone to so something that you are not willing to do" Be sure to include only pertinent information in case studies
SMALL GROUP DISCUSSION OR ACTIVITY: May be more comfortable for participants		
Advantages	**Disadvantages**	**Pointers**
Same advantages as for large group discussion Participants are more likely to contribute their own thoughts, words to smaller group New ideas may be generated based on expertise of participants Breaks up tedium of listening to one person lecturing Involves participants in active listening and participation Presenter can circulate among groups and ascertain levels of expertise, problems, or gaps in knowledge	Participants must have basic information on which to build discussion; trainer must lay some content foundation Participants may not stay on task, without focusing, discussions can wander far afield Not all participants will feel equally valued One group may demand a lot of assistance from the presenter, leaving other groups to act independently even if they also require help Time consuming Must rely on participants for recording and reporting results	Time limits and goals must be explicitly set Have specific format for all groups to follow Have prearranged cueing system or signal to bring groups back together Try to have groups of not larger than 8 persons to maximize interaction and reduce fear of "speaking" in a large group

Table 9-1. Adult Learning Strategies

LECTURE: A useful strategy for conveying information to a large group

Advantages	Disadvantages	Pointers
Most efficient and low-cost method of transmitting information in a classroom setting Conveys basic information to entire audience rapidly Can be used regardless of group size	Presenter must be dynamic, energetic and knowledgeable Presenter must have clear, pleasing speech Puts participants in a position of sustained, passive listening Not all adult learners process information well auditorally Too much information presented at one time is "lost" on staff unless supported by handouts, notes, etc. Used by itself, will never lead to real learning	Must be as carefully designed and planned as any other training activity Work to involve participants and maximize understanding and retention through participative techniques Plan strategies to get participants attention Outline key ideas at outset to help learner develop mental set and recognize relevant details as they listen Use visual backup such as overhead transparencies, flip charts, demonstrations, handouts Recap major points as a review Give time for information debriefing through group processing, questions, discussion, participant review or an experiential activity

MENTAL IMAGERY: Visualize an object, person, place or action not actually present.

Advantages	Disadvantages	Pointers
Especially valuable as a way to help participants mentally rehearse putting skills into action and to bring feelings and events into focus Since they are internal, exercises cause less anxiety to those participants who are shy about performing in front of others When participants are guided to visualize a real or fantasized experience, thoughts and feelings relevant to a particular topic can be activated, creating lively discussions	There must still be a minimal amount of role playing with mental imagery exercises Participants may not have enough experience with controlled imagination to be able to respond as directed by the leader You may not have participated in imagery exercises enough to feel comfortable guiding others into the experience	Can be used to replace role playing Help participants clear their minds first, by encouraging them to relax Give imagery instructions slowly and with enough pauses to allow images to develop Invite participants to share their imagery; but it must always be voluntary Imagery experiences can also be recorded in a participants personal journal

Table 9-1. Adult Learning Strategies

READ AND DISCUSS: Participants are asked to read a short, pertinent handout

Advantages	Disadvantages	Pointers
Excellent way to cover new material without lecturing Material in journals or articles is well thought through and precisely presented Some people learn and retain information easiest by reading Exposes participants to experts in the field Good way to introduce vocabulary Participants can take home article or handout to reread at their leisure	Some participants may not be able or feel comfortable reading quickly on the spot	Materials to be read should be carefully chosen and be pertinent to presentation Allow sufficient time for most participants to complete reading before signaling start of discussion

VISUAL BACKUP: Enable participants to see as well as hear what you are saying

Advantages	Disadvantages	Pointers
Adds emphasis to the material and subjects being presented Provides structure or guidelines A picture is worth a thousand words	Not all participants will have excellent view of screen or presentation area Takes time and money to prepare ahead of time Requires good audio-visual equipment in workable condition and/or materials which may be costly or unavailable	Practice using equipment and/or materials so that their use is smooth and does not distract or delay the presentation Make sure all equipment and materials are in working order before presentation begins Never present materials you have not practiced with or used before Sit in all parts of room to make sure all materials can be seen and/or heard comfortably by all participants

WRITING TASK: Allows each participant to reflect slowly on their own understanding

Advantages	Disadvantages	Pointers
Especially useful when any writing skill is being taught Provides a method of determining how much of the presented material has been retained by the participants A useful method of reinforcing other training strategies by asking participants to create outlines or lists of what has been presented	At the beginning or end of a training session, a long writing project will make a program drag A writing task may be viewed as busy work with no good purpose Confusion can be created if participants aren't perfectly clear on what they are to write The training area may not provide an adequate environment for writing	Prepare a worksheet to provide specific instructions concerning what the participant is to write Do something before a writing exercise to inspire or challenge the participants Be certain that participants have enough space and adequate light to write comfortably Allow enough time for feedback when participants have finished, either with the group or between partners

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SAMPLE WORKSHOP - Introduction to AAC

Agenda

9:00 - 9:30	Sharing Ideas
9:30 - 10:30	Engineering the Environment
10:30 - 10:40	Break
10:40 - 11:10	Cooking Communicatively
11:10 - 12:00	The Feature Match Process to AAC Device Selection
12:00 - 1:00	Lunch
1:00 - 2:00	Access: Direct and Indirect Selection Techniques
2:00 - 2:30	Case Study - Making the Match
2:30 - 3:30	Hands on with AAC Devices
3:30 - 4:00	Comprehensive Technology Integration Plans

Sharing Ideas

This workshop began with a sharing session. Participants were attending the trainings as teams, with 4-5 members per team. Each team was invited to bring ideas and materials from their classrooms that utilize augmentative communication techniques. A volunteer from each team demonstrated their materials and briefly discussed their ideas.

Engineering the Environment

This section began by asking the audience what they think of when they hear the word "engineering." The words were written on a flip chart. This list was then compared to what the presenters thought of when engineering the preschool environment for assistive technology. Participants were then shown a 10 minute video, and asked to list as many elements of the environment that they could find which had been engineered. The presenters emphasized how many displays and symbols were positioned around the classroom for easy access. This workshop focused on overlaying classroom activities with symbol displays and using aided language stimulation for improving both receptive and expressive language. Pitfalls for AAC users, outlined in Engineering the Preschool Environments for Interactive, Symbolic Communication (Goossens', Crain & Elder, 1992), were given as a lecture with copies of pictures from the book enlarged on overheads. Methods for designing overlays were quickly reviewed (see Appendix A). Participants were then asked to brainstorm vocabulary for "washing hands" as a large group. Words were listed on an overhead; numbers were added according to importance; parts of speech were labeled; and a 16-location overlay was drawn out. This was then compared to the pre-made overlay in Communication Displays for Engineered Preschool Environments, Book I (Goossens', Crain & Elder, 1994). Participants were invited to compare their vocabulary choices, and think about why the overlays look different.

Cooking Communicatively

This section was intended as an opportunity for the attendees to observe aided language stimulation and prompting techniques. An outline of cueing and prompting techniques was handed out. Four different participants were given four different augmentative communication devices. In two cases, participants were given instructions to activate their devices when they thought it was appropriate (independently). The other two were asked to wait until one of the presenters cued them. Before the activity began, each participant was given a sheet of paper with the following questions:

1. List the cueing strategies that you observed during the cooking activity.
2. Was the vocabulary on the device adequate for communication needs during the cooking activity? If not, what would you add?
3. Were the symbols used for vocabulary representation meaningful to you?
4. Would the symbols be functional/meaningful for the children in your class?
5. What is your feeling about single word verses phrase or sentence-based vocabulary?

The cooking activity was led by one of the presenters, while the other two acted as facilitators of appropriate device use. The leader used open-ended questions, pauses and hints. The facilitators used physical prompts, pointing, and flashlight cueing. These techniques were then reviewed at the end of the session, and participants were invited to share their impressions based on the questions listed above.

The Feature Match Process to AAC Device Selection

This section was presented as lecture with visual support and demonstration. The process for identifying client needs and device features was outlined (see Table 3-2). Various devices were shown as examples. This could be done with actual devices or slides. Overheads were designed to follow the outline of the presentation.

Access: Direct and Indirect Selection Techniques

During this time, presenters demonstrated a variety of devices, noting the configuration of the overlays and methods to access. Overheads were developed to outline each access method. Scanning patterns were shown on the devices themselves. As they were scanning, presenters carried the devices around the room so that all participants could see.

Case Study - Making the Match

Participants were invited to read the case study on page 65 and discuss the study questions in small groups. A volunteer from each group was then invited to share their answers with the entire group. Discussion points related to the feature match approach and thoughts for using an appropriate device in a functional manner.

Hands on with AAC Devices

Every time we do a presentation on assistive technology, we try to allow participants the opportunity to manipulate the devices. In this case, six different stations were set up around the room. At each station was a set of instructions for programming the device and a brief description of the activity which the participants were invited to try. Participants were given 15 minutes per station, so that each participant was able to try three different devices. At 3:15, participants at each of the stations were invited to share their impressions. Below are some example activities:

1. At the Hawk station, participants were given an overlay with symbols for "Simon Says ... Farm Animals." The activity involved designing a similar overlay for zoo animals. Participants were given a blank overlay. They either wrote words or drew pictures, placed the overlay on the device and recorded the new vocabulary. When they were finished, they returned the farm animal display and recorded again, so that the next group could start at the same point.

2. At the Say-It station, the device was programmed with "duck" and "goose." Instructions included role-play of the activity with the device. They were then invited to list other choices for 2-location games, either altering the words or the rules.

3. At the Speakeasy station, participants were given an overlay and the story "Brown Bear, Brown Bear." They were invited to brainstorm props they would use, program the device, and role- play. They were also asked to consider how they would use a remote switch with a child who could not direct access the device. Afterwards, they were asked how they could modify the activity for the holidays, writing their own story and designing a vocabulary display.

Comprehensive Technology Support Plans

In order for participants to use the information they learned in this workshop, we provided blank Comprehensive Technology Support Plans (Appendix C). The sample from the case study was reviewed. Participants were then asked to divide into small groups, based on teams who work together. Within their group, they were instructed to discuss a particular child who would benefit from augmentative communication and outline goals during a few typical routines or activities. A volunteer from each group then summarized for the entire group. Presenters were available to support and challenge participants during the small group time and also helped refine their goals and strategies as they reported to the entire group.

Resources for Presenters

Look carefully through each section of this manual for information about resources. You may want to contact vendors and company representatives for flyers, catalogs, equipment loans, sample software, and technical assistance. Some companies will also send people out to conduct training for your staff.

When designing your workshop materials and strategies, you may find the following books helpful:

Petit, A. (1994). Secrets to enliven learning: How to develop extraordinary self-directed teaching materials. San Diego, Ca: Pfeiffer & Company.

Scannell, E. & Newstrom, J. (1991). Still more games trainers play: Experiential learning exercises. McGraw-Hill, Inc.

Silberman, M. (1995). 101 ways to make training active. San Diego, CA: Pfeiffer & Company.

Silberman, M. (1990). Active training: A handbook of techniques, designs, case examples and tips. San Diego, CA: University Associates, Inc.

Stoneall, L. (1991). How to write training materials. San Francisco, CA: Prieffer, Jossey-Bass.

REFERENCES

Angelo, J. & Lane, S. (Ed). (1997). Assistive technology for rehabilitation therapists. Philadelphia: F.A. Davis Company.

American Speech-Language-Hearing Association. (1993, June). ASHA Journal, pp. 25, 44.

Arkwright, J. & Ellis, L. (1992). CCP: Comprehensive Communication Profile. Wayne, MI: Adamiab Assistive Technology Resources.

Aug-Communique. The Quarterly Newsletter of the North Carolina Augmentative Communication Association. Gracie Williams NCACCA, 5341 Thayer Dr., NC 27612-5947.

Berger, A. & Belbach, K. Adaptive Switch Technology. Kew Garden Hills, NY: Steppingstone Day School, Inc.

Beukelman, D. & Mirenda, P. (1992). Augmentative and Alternative Communication: Management for Severe Communication Disorders in Children and Adults. Baltimore, MD: Paul H. Brookes.

Blackstone, S. (1992). Technology in the Classroom: Communication Module. Rockville, MD: American Speech-Language-Hearing Association.

Bruno, J. (1991). Book Cooks. Cypress, CA: Creative Teaching Press, Inc.

Burkhart, L. (1980). Homemade battery powered toys and educational devices for severely handicapped children. Linda Burkhart, 6201 Candle Court, Eldersburg, MD 21784.

Burkhart, L. (1987). Using computers and speech synthesis to facilitate communicative interaction with young and/or severely handicapped children. Linda Burkhart, 6201 Candle Court Eldersburg, MD 21784.

Burkhart, L. (1993). Total augmentative communication in the early childhood classroom. Linda Burkhart, 6201 Candle Court, Eldersburg, MD 21784.

Casey, K. (1995 November). Play-Based Assessment for AAC. ASHA Special Interest Divisions, p. 10.

Cassatt-James (1992). Technology in the classroom: Applications and strategies for the education of children with severe disabilities. Education module. Rockville, MD: American Speech-Language-Hearing Association.

Charlebois-Marois, C. (1985). Everybody's Technology. A sharing of ideas in augmentative communication. Montreal, Quebec: Charlecoms Enr.

Cook, A. M, & Hussey, S. M. (1995). Assistive technologies: Principles and practices. Chicago: Mosby Yearbook.

Curtis, D. & Carter, M. (1996). Reflecting children's lives: A handbook for planning child-centered curriculum. St. Paul, MN: Redleaf Press.

Cutting, B. (1989). Getting started in whole language: The complete guide for every teacher. Bothell, WA: The Wright Group.

Dodge & Colker (1995). The creative curriculum. Washington DC: Teaching Strategies.

Doster, S., & Politano, P. (1996). Augmentative and alternative communication. In Hammel. J., (Ed.) Technology and occupational therapy. A link to function. Besthesda, MD: American Occupational Therapy Association.

Elder, P. & Goossens', C. (1994). Engineering Training Environments for Interactive Augmentative Communication: Strategies for Adolescents and Adults who are Moderately / Severely Developmentally Delayed. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Flippo, K., Inge, K. & Barcus, J. (1995). Assistive Technology: A Resource for School, Work, and Community. Baltimore, MD. Paul H. Brookes.

Fraser, B., et.al. (1994). Physical characteristics assessment: Computer access for individuals with cerebral palsy. Wauconda, IL: Don Johnston, Inc.

Gallivan-Fenlon, A. (1994). Integrated transdisciplinary teams. Teaching Exceptional Children, 16-20.

Golinker, L. & Mistrett, S. G. (1997). Funding. In Angelo, J. & Lane, S. (Ed.). Assistive technology for rehabilitation therapists. Philadelphia: F. A. Davis Company.

Goossens', C. (1989). Aided communication intervention before assessment: A case study of a child with cerebral palsy. Augmentative and Alternative Communication, 5, 14-26.

Goossens', C. & Crain, S. (1985a). Augmentative communication: Assessment resource. Wauconda, IL: Don Johnston Developmental Equipment.

Goossen's, C. & Crain, S. (1985b). Augmentative communication: Intervention resource. Wauconda, IL: Don Johnston Developmental Equipment.

Goossens', C. & Crain, S. (1992). Utilizing switch interfaces with children who are severely physically impaired. Austin, TX: Pro-Ed.

Goossens', C., Crain, S. & Elder, P. (1992). Engineering the Classroom Environment for Interactive Symbolic Communication: An Emphasis on the Developmental Period 18 months to five years. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Goossens', C., Crain, S. & Elder, P. (1994). Communication Displays for Engineered Preschool Environments. Birmingham, AL: Southeast Augmentative Communication Conference Publications Clinician Series.

Hall, M. (1988). Getting funded: A complete guide to proposal writing. Portland, OR: Continuing Education Publications.

Hanser, G. (1995). Training materials. Paradise Valley Unified School District, Phoenix, AZ.

Henderson, J. (1993). Preschool AAC checklist. Solana Beach, CA: Mayer-Johnson Co.

Herrera, D. (1995, October). How do I get Johnny to "talk"? Facilitating communicative interaction of persons who use AAC. Presented at16th Annual Southeast Augmentative Communication Conference Proceedings, Birmingham, AL.

Hodgdon, L. A. (1995). Visual strategies for improving communication. Volume I, Practical Supports for School and Home. Troy, MI: QuirkRoberts Publishing.

Hutinger, P. (1993). A switch to turn kids on. Macomb, IL: Macomb Projects. College of Education, Western Illinois University.

Infant Child Communication Research Programs (1995a). Comprehensive inclusion for young children with disabilities: Issues, guidelines and practical strategies. Tempe, AZ: Arizona State University.

Infant Child Communication Research Programs (1995b). Quality indicators for inclusive preschool classrooms: A self-study assessment and planning guide. Tempe, AZ: Arizona State University.

Johnson, B. & Plemins, B. (1978). Up cooking. Lake Alfred, FL: Early Educators Press.

Jones, K J. & Armstrong, J. (1995). Assistive technology assessment: Answering the questions. Presentation Greensboro. Gateway Education Center.

Kelly, J. & Friend, T. (1993). Hands-on reading., Solana Beach, CA: Mayer-Johnson Co. (Also available, More Hands-On Reading, 1995).

King De-Baun, P. (1990). Storytime: Stories, symbols and emergent literacy activities for young, special needs children. Park City, UT: Creative Communicating.

King-DeBaun, P. (1994). Storytime holiday fun!: Stories, symbols, and emergent literacy activities for young children. Park City, UT: Creative Communicating.

Koppenhaver, D. & Yoder, D. (1993). Classroom literacy instruction for children with severe speech and physical impairments (SSPI): What is and what might be. Topics In Language Disorders, 13, 1-15.

Lloyd, L. & Fuller, D. (l986). Toward an augmentative and alternative communication symbol taxonomy: A proposed superordinate classification. Augmentative and Alternative Communication.

Macombe Projects. (1993). A switch to turn kids on: A guide for constructing adaptive devices. Macomb, IL: Western Illinois University.

Mann, W. C., & Lane, J. (1995). Assistive technology for persons with disabilities, second edition. Besthesda, MD: The American Occupational Therapy Association.

Manlove, M. (1996, Spring). A checklist for identifying funding sources for assistive technology. Teaching Exceptional Children, pp 20-24.

McNairn, P. & Shiolena, C. (l994). quick tech readable, repeatable stories and activities. Solana Beach, CA: Mayer-Johnson Co.

Musselwhite, C. (1985). Songbook: Signs and symbols for children. Litchfield Park, AZ: Author.

Musselwhite, C. (1986). Adaptive play for special needs children: Strategies to enhance communication and language. Austin, TX: Pro - Ed.

Musselwhite, C. (1991). Mini-grants and volunteers: Developing support for augmentative communication programs. Birmingham, AL: Southeast Augmentative Communication Conference Publications.

Musselwhite, C. & King-DeBaun, P. (1997). Emergent literacy success: Merging technology and whole language for students with disabilities. Birmingham, AL: Southeast Augmentative Communication Conference Publication Clinician Series.

Musselwhite, C. & St. Louis, K. (1988). Communication programming for persons with severe handicaps. Austin, TX: Pro - Ed.

Oberstein, J. S. (1995). Equalizing developmental opportunities for youngsters with disabilities. Arizona Medicine, Vol. 6, Number 6, 11.

Pedersen, J. (1996). Seating and wheeled mobility for OTs. In Hammel, J. (Ed.) Technology and occupation therapy: A link to function. Besthesda, MD: American Occupational Therapy Association.

Rappaport Morris, L. & Schulz, L. Creative play activities for children with disabilities. Champaigne, IL: Human Kinetics Book.

Richman, L. G. (1988). Stories about me. Solana Beach, CA: Mayer-Johnson Co.

Silberman, M. (1990). Active training: A handbook of techniques, designs, case examples and tips. San Diego, CA: University Associates, Inc.

Silberman, M. (1995). 101 ways to make training active. San Diego, CA: Pfeiffer & Company.

SWHD Teaching Center (1995). Teaching others about... Adult leaming. Training Curricula.

Trefler, E. (l992). Technology in the classroom: Applications and strategies for the education of children with severe disabilities. Positioning, access, and mobility module. Rockville, MD: American Speech-Language-Hearing Association.

VanTatenhove, G. (1993). AAC intervention: "Fields of dreams." Wooster, OH: Prentke Romich Company.

Westby, C. (1980). Assessment of cognitive and language abilities. Language, Speech and Hearing Services in Schools, 11, 154-168.

Williams, B., Briggs, N., & Williams, R. (1979). Selecting, adapting and understanding toys and recreation materials. In P. Wehman (Ed.), Recreation programming for developmentally disabled persons (pp. 15-36). Austin, TX: PRO - ED.

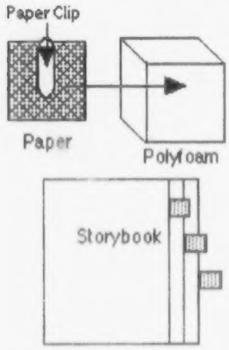
Wright, C., & Nomura, M. (1985). From toys to computers. San Jose, CA: Author.

Zabala, J. (1997). The SETT Framework: Critical areas to consider when making informed assistive technology decisions. Paper presented at EXPO '97, Phoenix, AZ.

APPENDIX A

“HOW-TO” INSTRUCTIONS

PAGE FLUFFERS (Musselwhite & King-DeBaun, 1997)



Use "page fluffers" to separate the pages of a book, to permit page turning with a whole hand or a headstick.

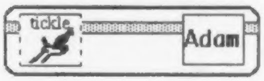
1) Cut a piece of heavy paper (e.g., file folder) 1" x 12".
2) Space 12 paper clips evenly over the paper.
3) Cut a piece of polyfoam the same size as the paper.
4) Hot glue the foam onto the paper, leaving one side of the paper clips exposed.
5) Cut into 12 pieces, 1" square.
6) Use in books by affixing to the back side of pages, in a staggered arrangement.

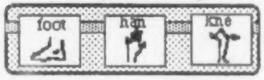
CHOICE BOARD (Musselwhite & King-DeBaun, 1997)

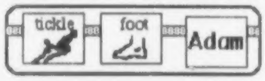
Songs and stories can be constructed using a slot-filler format. A choice board is used to provide the frame and the choices of words to insert. Directions are as follows:

1) Cut a piece of foam core art board, 15" x 4".
2) Cut a length of soft velcro 15", then cut velcro lengthwise.
3) Attach velcro to each side, 1" from top of choice board.

Typically, the frame sentence ("tickle" + empty slot + "name") is placed on the front of a choice board, with choices ("foot", hand", "knee") placed on the back. The student picks a symbol from the back, places it in the slot on the front, then "sings" the song while the facilitator cues as needed.


SLOT-FILLER (Empty Slot)

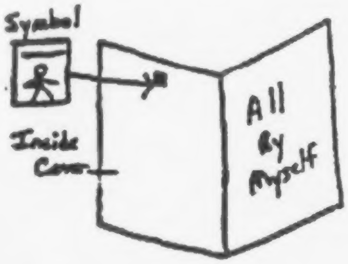

CHOICES (Back of Song


SLOT-FILLER SENTENCE (Completed)

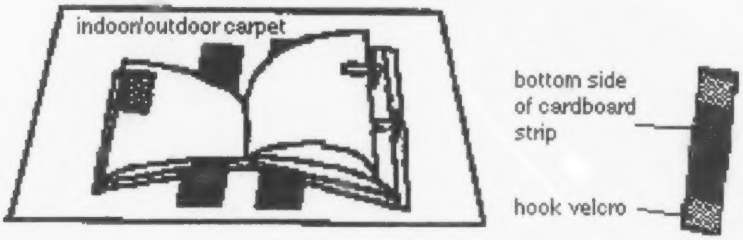
ADAPTATIONS FOR REPEATED LINES (Musselwhite & King-DeBaun, 1997)

These simple adaptations prepare of-the-shelf books for efficient and successful use. Repeated lines may be recorded on a loop tape for use with an adapted tape recorder or recorded on communication devices.

1) Prepare a symbol to represent each repeated line. Color symbols as appropriate, laminate, and add male (hook) velcro to back of each.
2) Affix female velcro to matching book, for storing repeated lines symbols
3) Add a piece of colored VC tape to spine of book (to code as a story with repeated lines).
4) Highlight repeated lines in text of book.
5) Remove the symbol from the book and affix to switch, communication display or communication device when reading.



BOOK HOLDER (Burkhart, 1993)



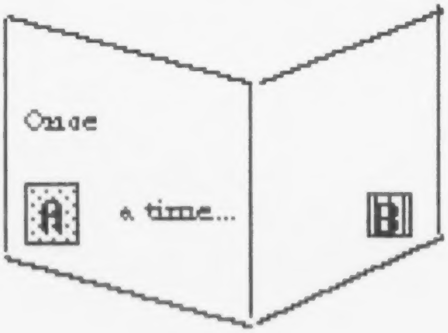
A book holder can be used to hold a book in a stable position with the front and back covers opened while the student reads.

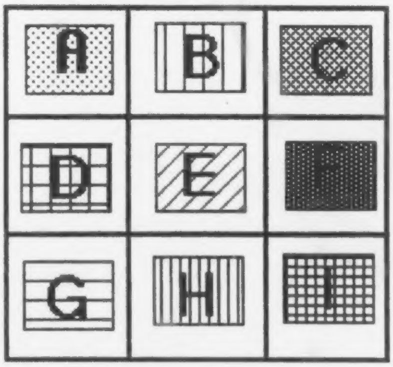
1) Cut out a piece or indoor/outdoor carpet 18" x 15".
2) Cut two long rectangles of cardboard (e.g., poster board, folder) 2" x 12".
3) Affix stickyback male (hook) velcro at the top and bottom of underside of cardboard rectangles. It will adhere to the carpet.
4) Place book on top of the carpet square. Use the cardboard rectangles to hold front and back covers down.

COLOR CODED OVERLAYS (idea from Burkhart, 1993)

This idea suggests adapting short, simple books for short term use, without the hassle of creating a symbol communication display for each book. Here is an abbreviated version of the directions (compiled by Caroline Musselwhite, 1995):

1) Cut out 1 1/2" squares of six different colors of Post It notes, two squares per color (total of 16 squares, 2 yellow, 2 blue, etc).
2) Write the alphabet letters A-F, with the same letter on both colored squares (e.g., yellow = A; blue = B).
3) Using a blank 8-location Macaw overlay, place one set of colored squares, in alphabetical order (see illustration).
4) Place matching set of squares on the book pages (see illustration).
5) Record the book pages into the Macaw. Now when the student sees a yellow Post It with the letter A in her book, she presses the matching square on her device and it reads the page!





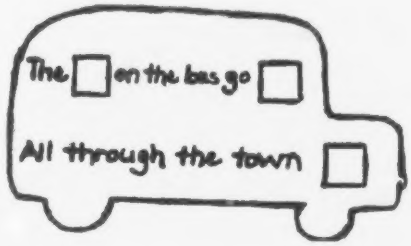
WHEELS ON THE BUS SONG DISPLAY

1) Cut out the shape of a bus from a piece of construction paper (about 10" high and 17" wide).

2) Write the following sentence in large letters, leaving spaces for symbols:
   The ______ on the bus go _______

   All through the town.

3) Draw a 2" square in each of the spaces. Laminate the bus. Put small pieces of rough (male) velcro at the top center of each square.



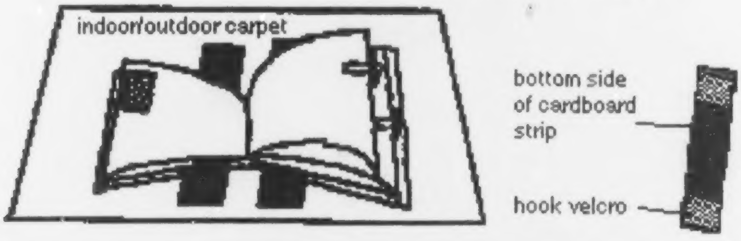
4) Copy, color and laminate the symbol for town. Place a small square of rough (male) velcro on the back, top center. Put it in the lower square on the bus. This symbol can then be removed and placed on a single message device in order for a child to participate by singing the repeated line of the song.

5) Copy, color and laminate symbols for nouns (yellow) and verbs (pink). You may start with traditional choices (mommy, baby, sister, etc.) and then extend into holiday themes. For example: the ghosts go Imo, witches go 'tee hee hee", Santa goes "ho ho ho", elves go "tap tap tap." Place rough (male) velcro on back.

6) Place two rows of soft (female) velcro (the length of the bus) on the back of the bus. Put the choices on the back of the bus. As children make choices, help them to move symbols to the appropriate space on the front of the bus. Sing the song. Encourage silly as well as traditional choices.

THE ☐ ON THE BUS GO ☐
ALL THROUGH THE TOWN ☐

BOOK HOLDER (Burkhart, 1993)



A book holder can be used to hold a book in a stable position with the front and back covers opened while the student reads.

1) Cut out a piece or indoor/outdoor carpet 18" x 15".
2) Cut two long rectangles of cardboard (e.g., poster board, folder) 2" x 12".
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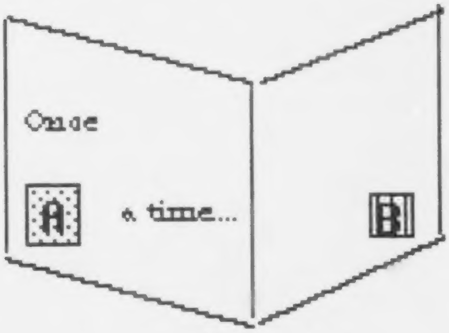

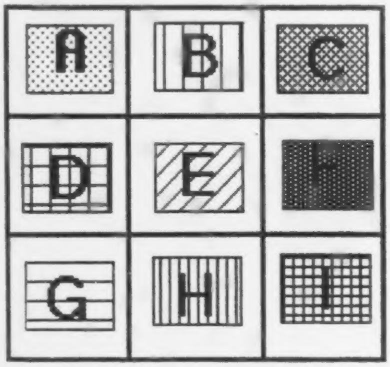

WHEELS ON THE BUS SONG DISPLAY

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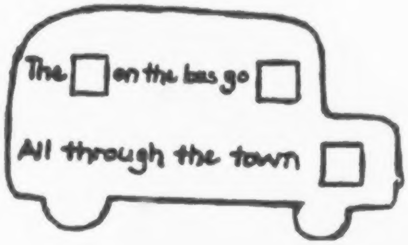
   The ______ on the bus go _______

   All through the town.



3) Draw a 2" square in each of the spaces. Laminate the bus. Put small pieces of rough (male) velcro at the top center of each square.

4) Copy, color and laminate the symbol for town. Place a small square of rough (male) velcro on the back, top center. Put it in the lower square on the bus. This symbol can then be removed and placed on a single message device in order for a child to participate by singing the repeated line of the song.

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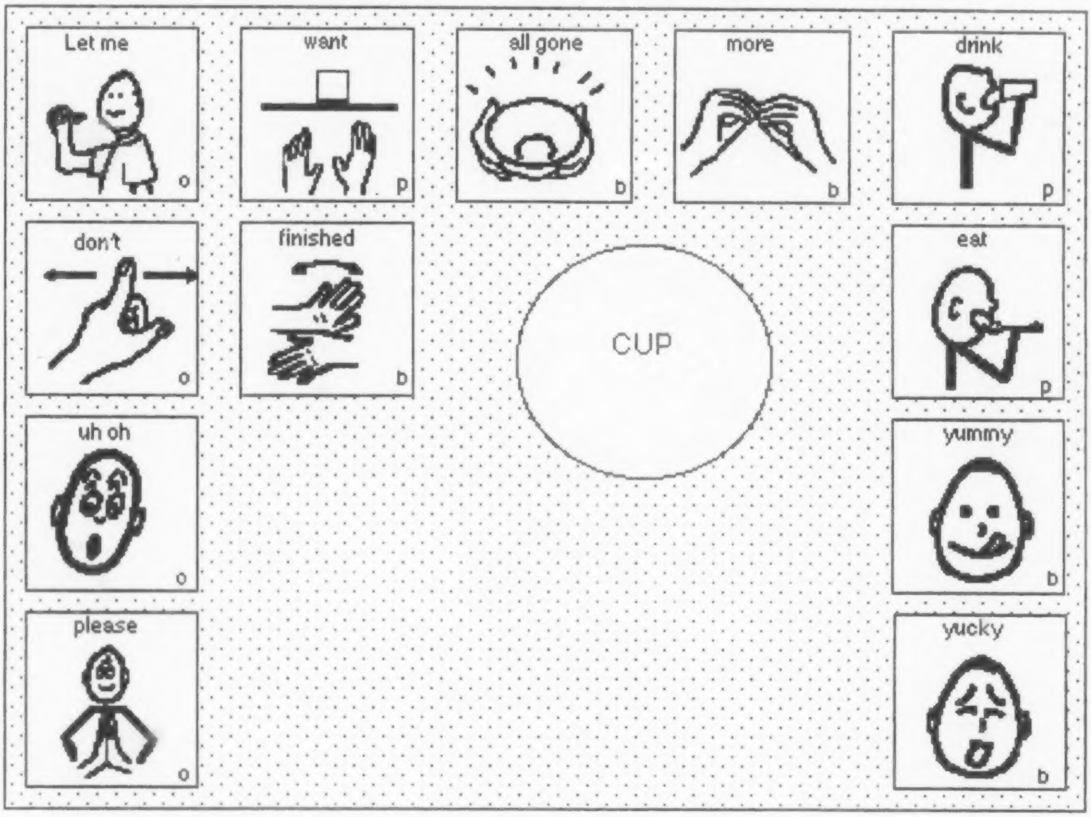
THE ☐ ON THE BUS GO ☐
ALL THROUGH THE TOWN

GENERIC PRESCHOOL SYMBOL PLACEMAT


Let me
o
want
p
all gone
b
more
b
drink
p
don't
o
finished
b
CUP
eat
p
uh oh
o
yummy
b
please
o
yucky
b

Directions:

1) Draw 2" symbols to match the vocabulary as illustrated. (You may use Boardmaker or PCS symbol book if you have it).
2) Color the backgrounds according to the color codes in the corner of each symbol (leave the symbol and the word white).
3) Cut a file folder or a piece of construction paper to size as needed. (File folders cut to 12 ½" by 13" work well.)
4) Cut out symbols and glue around the perimeter as shown.
5) Cut and glue on a small circle for cup and a larger circle for plate (optional).
6) Laminate to protect.

CREATING VOCBULARY DISPLAYS (Goossens', Crain & Elder, 1992)

When creating vocabulary displays for the 'engineered' preschool environment, focus initial attempts on overlaying AAC on activities that are already taking place within the classroom (Goossens', Crain & Elder, 1994).

1) Write down your daily routine and then list specific activities within each routine. Preschool classroom routines typically include the following: large group, small group, outside, snack, center-based play, and transitions. Activities may include: singing songs, choosing songs, bookreading, art projects, toileting, cooking, eating snack, group games, outside activities (e.g., bubble blowing, slide), and classroom centers (e.g., preparing the table in housekeeping, making a town with blocks, playing with legos).

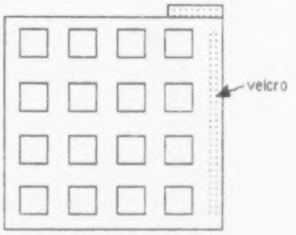
2) Rank order these activities to delineate which ones you want to focus on initially. Plan to add symbol support first during the most interactive, fun activities. Continue to add support for the others as time and staff allow.

3) Choose 5 specific activities to get started.

4) Brainstorm with as many team members as possible some specific words and phrases which may be used during these 5 chosen activities.

5) Rank order 32 of the words/phrases which will be represented symbolically.

6) Consider the abilities of the children in your class to determine the best way to display the symbols (16 location boards, eye gaze frames, various types of switches/devices used).

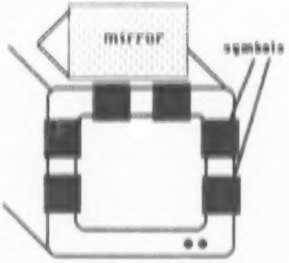


7) Choose symbols for each display you will be making, color-code, arrange on the chosen display format and laminate.

8) To design a 16 location display for aided language stimulation, either copy a pre-made display from Goossens', Crain & Elder (1994) or use your own list (created above).

9) Cut out the symbols and place evenly on a file folder or oak tag (about 13" square). Keep the symbols in this order: misc (orange), verbs (pink), descriptors (blue), prepositions (green), then nouns (yellow). Try to start a category at the top, with extra symbols carried across the bottom. Keep symbols that occur across multiple displays in the same location. Laminate. Put female velcro on the right side.

COMPUTER SUPPORT: SYMBOLS



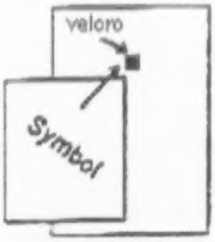
Symbols can be used at the computer to provide symbol and text support both generically (e.g., symbols for directions) and specifically (e.g., symbols to make choices or comment on specific off-the-shelf or special needs software).

1) Use symbol generating software such as Board Builder or Board Maker (Mayer Johnson Company).
2) Templates for 2" symbols or the Wolf 9-location overlays provide nice size.
3) Create generic symbols such as: Directional symbols plus words; MORE, GET IT, GO, STOP, TURN THE PAGE, TRASH IT.
4) Create software-specific symbols.
5) Prepare symbols by cutting them apart, coloring and laminating each.
6) Place square of male (hook) velcro on each.
7) Place female (loop) velcro around the screen of the computer.
8) Place a mirror above the screen to look at the students eye gaze at the computer.

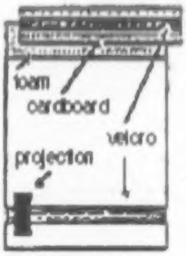
Computer Flap Switch (Musselwhite & King-DeBaun., 1997)

A flap switch is used to cover up unnecessary keys for successful computer use by children who have difficulty accessing single keys. Software which uses the space bar, command key or return keys work well with this modification.

1. Cut foam core art board 3 1/2" x 5".
2. Cut cardboard strip 3 1/2" x 1".
3. Cut hook and loop velcro, 3 1/2" x 1/2".
4. Cut hot gluestick 1/2" (projection).
5. Cut small square loop velcro
6. Make a "sandwich," gluing cardboard strip, foam strip and art board.
7. Add hook (male) velcro to cardboard strip.
8. Add loop (female) velcro at bottom of inside of flap switch.
9. Use a small piece of velcro to affix glue piece.
10. Place soft (female) velcro on top surface of the keyboard.
11. Place the flap switch over the keyboard.
12. Position the gluestick to depress one key (as determined by the software).



Flap Switch: Top View

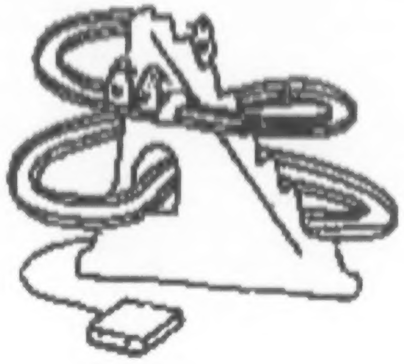


Flap Switch: Bottom View

COUNTING WITH A SWITCH AND BATTERY POWERED TOY

(Burkhart, 1993)

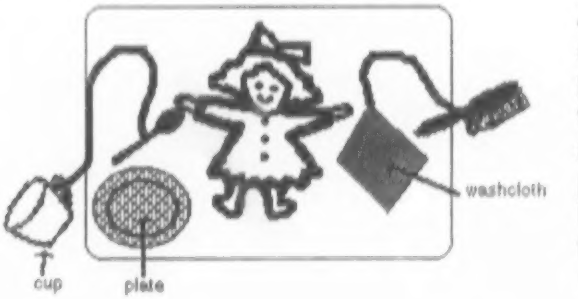
Use a battery toy that has multiple moving figures to count: penguins going down a slide, dolphins jumping through a hoop, cars going around a track, koalas that climb a tree and then slide down, etc.



1) Place a wad of "stick tac" or "blue tac" on the track about 6-8 inches down the slide from the top of the escalator as a stop for the penguins.
2) Slide the battery interrupter into the battery compartment and plug the switch into it. Make sure the switch on the toy is in the "on" position.
3) Space the penguins evenly on the stairs to allow more time between each.
4) Have the child activate the switch to get a specified number of penguins onto the slide. When that many penguins are on the slide, the child should release the switch. Most toys have just three penguins or figures, so if you are wanting to count higher than 3, buy several toys and use all the penguins on the one track.

EARLY PLAY BOARD

(Musselwhite & King-DeBaun, 1997)



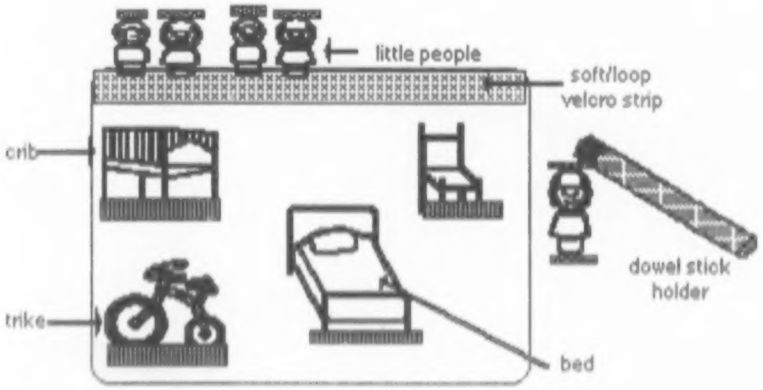
A play board is intended to permit easy access to play materials for students with physical disabilities. It can be mounted on the child's lap tray with velcro, or can be affixed to a slantboard, mounted to the play surface. An early play set offers large, realistic toys that can be used together.

1) Cut a piece of cardboard 10" x 14" (note: tri-wall is best)
2) Cover front with solid colored contact paper.
3) Affix stickyback female (soft) velcro la X 40 to mount doll, picnic plate, or other central play object.
4) Affix other play objects with velcro (e.g., small plate) or elastic, as appropriate to object.
    a) For velcro, use female (soft) velcro on playboard, male (rough) on toy.
    b) For elastic, use ¼" or round elastic, cut in 1 yard lengths. Tie one end around toy; make two small slits in playboard l' apart; insert end of elastic in first hole from front of playboard; bring through second hole, back through first, and out second; then tie second toy on end.
5) Add foam curler covers to handles of spoons, etc., to provide an easier surface for grasping.

MINIATURE PLAY SET (Musselwhite & King-DeBaun, 1997)

This play set is intended to permit easy access to play sets (e.g., Fisher Price sets) for students with physical disabilities. It can be mounted on a child's lap tray with velcro, or can be affixed to a slantboard, mounted to the play surface. A miniature play set offers access to normative symbolic play materials.

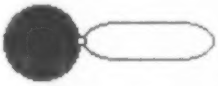
1) Cut a piece of cardboard (tri-wall) or indoor/outdoor carpet 10" x 14".
2) If using cardboard, cover front with solid colored contact paper and affix stickyback female (soft) velcro in places where you want to mount various objects (e.g., chair, crib, swing).
3) Affix stickyback male (rough) velcro to bottom of play objects.
4) Affix stickyback male (rough) velcro to head and feet of play people.
5) Make a "people holder" as follows: Cut a ½" piece of C-PVC pipe or dowel stick in a 5" length. Affix stickyback female (soft) velcro around people holder at one end.



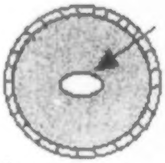
Battery Adapted Fan Spinner

1. Remove cap from fan.

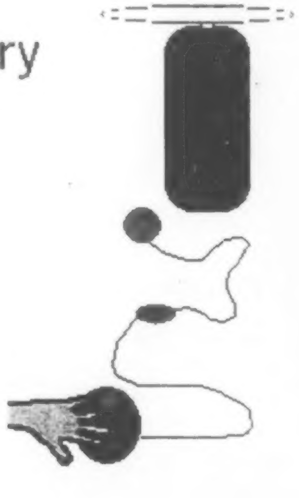
2. Remove both plastic blades.
3. Place one blade back in the fan, upside down. Replace cap.



4. Trace bottom of fan on a paper plate. Cut out hole.



5. Divide the plate into sections and color or add velcro for symbol choices.
6. Slide plate on from the bottom. Slide plastic stand under the plate to hold it in place.
7. Place battery interrupter in battery case. Insert switch plug into the battery interrupter.
8. Turn the fan to the "on" position.
9. Push the switch down, hold and release for random choices.



APPENDIX B

SAMPLE MINI-GRANT

Sample Grant: Adapted Activity Centers

Begin with a cover letter. The following text describes the grant itself.

Our preschool center has been set up as a developmental day center, serving the needs of students with physical and cognitive disabilities. We have recognized for some time the importance of setting up activities that permit our students to interact with able-bodied students, through exchange projects at various preschools. We are now making a major effort to provide opportunities for students from IWC to be "integrated" into regular preschool settings, on a full- or part-time basis. It is very important that our students learn in an environment that is similar to that of traditional preschools, to ease the transition. Therefore, we are attempting to further "normalize" the preschool and nursery classes at IWC to permit use of center-based learning, and to encourage "reverse mainstreaming", with able-bodied students attending the center.

> **NEED:** Transitions from one setting to another are already difficult for students with special needs. We hope to reduce the difficulty by making our learning environment simulate as closely as possible a traditional preschool classroom. This would involve creation of "center-based learning". Thus, the transition from developmental day center to standard preschool would be less overwhelming to our students. In addition, centers provide a structure that is needed for all preschoolers, but particularly for preschoolers with special needs. They also provide a focus for teacher-directed learning, while still offering considerable control to each student (*See Appendix A for A Description Of Expected Benefits*).
>
> **PROJECT DESCRIPTION:** Each center would include standard materials that are commercially purchased or constructed. Modifications would be made as needed. Sample centers include: 1) Daily Living Center, including kitchen tables and chairs, clean-up sets, and tea party/picnic sets; Water Play Area, providing a place to play with water and sand; 3) Pretend Center, allowing imaginative play with themes changing each month; 4) Bookreading Center, permitting easy student access to books; 5) Music Center, offering songs and musical instruments; 6) Computer Center, permitting child-initiated computer exploration; and 7) Symbolic Toy Play Center, including a range of adapted toys. *See Appendix B For A Description Of Centers, Toys, And Adaptations. See Appendix C For A Description Of The Target Population.*

APPENDIX A: FACILITATION OF SPECIFIC AREAS OF DEVELOPMENT

Organizing the classes into center-based training can lead to improvement in a wide range of skill areas, as outlined below:

> **Gross Motor Skills:** Several of the centers (ex: Water Play, Daily Living) can be expected to facilitate gross motor skills through activities such as: *standing* with support from tables, etc; performing gross motor skills such as *sweeping*;

Fine Motor Skills: Toy play can enhance fine motor development including skills such as *reaching*, *grasping*, and *manipulating objects* (ex: pushing, pulling, rotating). This can assist in later skills such as writing, cooking, or typing.

Social Skills: Pretend play is an ideal medium for training social skills such as *turntaking*, *initiating interactions*, and *sharing*, as has been shown through numerous research studies. The Pretend Play Center will be highly useful for these skills. In addition, children "practice" skills such as asking politely and thanking a friend in the Daily Living Center.

Self-Help Skills: Play activities can be used to practice a variety of self-help goals, such as *feeding* (tea parties), *dressing* (dress-ups) and *personal hygiene* (doll play). Thus, the Daily Living and Pretend Play Centers will be particularly useful.

Cognitive Skills: Play tasks can be used to introduce skills such as *object permanence* (the idea that an object exists even through it is out of sight) and *means-ends* (exploring ways to achieve a desired goal). Centers that will be especially helpful are the Reading Center (ex: expanding information about the world) and Water Play Center (ex: using water play to learn skills such as spatial relationships, quantity, and one-to-one correspondence).

Communication Skills: Play, music, and reading all provide an excellent framework for teaching both *receptive* (understanding) and *expressive* (speaking) communication skills. For example, children can learn to follow verbal instructions through a variety of play tasks, or to give verbal instructions to a play partner. Adaptive play can also enhance learning of augmentative communication, either *unaided* (ex: using sign language to communicate) or *aided* (ex: using pictorial symbols and/or speech output devices to communicate).

APPENDIX B*:* DESCRIPTION OF CENTERS, MATERIALS,AND ADAPTATIONS

A range of centers are planned for the preschool normalization project. For each center, examples of materials and adaptations are suggested. This listing provides only a sampling of the possibilities, with many additional adaptations available. For further adaptations, see the resources at the end of this appendix.

Daily Living Center: This would include a small kitchen set, table and chair set, plus props such as tea sets, picnic sets, brooms, and tablecloths; *SAMPLE ADAPTATIONS:* play sets will be securely fastened, using industrial strength velcro and indoor/outdoor carpeting, as many of our students have poor balance and could knock them over; velcro can be used to fasten tea cups onto saucers, so that there is minimal beverage spill; place mats will provide basic symbol displays, with additional displays developed as needed for each student.

Computer Center: A computer has been purchased through a previous grant, but more software should be added to make this fully functional. Sample software includes bookreading software (e.g., *Livingbooks, Storytime*), early story construction software (e.g., *KidWorks2, IntelliTalk*) language stimulation software (e.g., *Bailey's BookHouse*; *Thinkin Things*). A printer is also needed to permit students to engage in early literacy activities. *SAMPLE ADAPTATIONS:* . Light-tech adaptations will be provided, such as: 1) Cardboard "flap switch", providing direct access to individual keys through a pushbutton affixed to a cardboard square (see illustration); 2) Symbol representation of software programs (ex: *Print Shop*) or of items within software programs (ex: borders and graphics from *Print Shop*) to facilitate easy choicemaking.

Pretend Center: This area would include materials and a cabinet for dress-ups, with monthly rotation of differing themes (ex: camping, circus, grocery store); *SAMPLE ADAPTATIONS:* signs and symbols for each activity will be posted in the area, to permit appropriate language stimulation by teachers and playmates. Velcro closures can be used for dress-ups, and dress-up "vests" may be used to permit easy placement over a child's head (idea: Marcia Nunnally, *Switching On to Make-Believe*, N.C.A.C.A. Conference, 1991.

Water Play Area: This area will include the purchase of a sand/water discovery table; ideally, such a table will include several "wells" for placing materials; separate tubs or drainage plugs should also be included, for easy clean-up of materials. In addition to water and sand, materials such as rice and beans can be placed in the wells, for practice in locating hidden objects, pouring, and making roads, castles, etc. *SAMPLE ADAPTATIONS:* The model discovery table purchased will include an indentation in at least one side to permit students in standers to more readily access the table; A pouring switch (SK) can help students with fine motor problems to engage in pouring.

Music Center: This center would contain accessible tape players and musical instruments, plus songs to be led by a teacher or peer; *SAMPLE ADAPTATIONS:* symbol- and sign-aided songs will be posted on the wall. For example, choicemaking symbols to support "Old MacDonald's Farm" (duck /horse/ cow) can be affixed via velcro to one side of a "song board" (cardboard rectangle covered with contact paper); when the child selects a symbol, the song board is turned over, and the symbol is placed in the designated spot to sing that verse. Students follow through pointing or via eye gaze (using light cueing with a small flashlight - idea from Goossens' and Elder). Sign support is used primarily as on-site reminders for teachers.

Bookreading Center: A wide range of books would be included, particularly repeated-lines books, signed storybooks, and books with symbols added; *ADAPTATIONS:* in addition to purchasing or adding signs and symbols to books, single message recording devices (e.g., BIGmack, Ablenet) will be ordered to help students "read" repeated lines or make comments on actions (see Musselwhite, 1992, for listing of specific books and strategies). Use of book easels or "page fluffers" (idea from P.J. Cushing, 1989) can also assist students with physical disabilities in accessing books. Students will each have access to a generic "bookreading page", providing opportunity to make general requests ("Turn the page"; "Let me see"; "Act it out") and general comments ("Uh-oh!"; "That's silly"). (*See Also the "Emerging Literacy Support Project*, in Chapter 2 of this publication).

Symbolic Toy Play Center: This center is primarily intended for the nursery students, as playing with traditional toys is often difficult due to physical disabilities. *ADAPTATIONS:* battery toys will be modified to accept switch use -- thus, the student can make a battery dog, car, or robot go by simply pressing on a switch. In addition, modifications will be made to Fisher Price style toys, adding stickyback male velcro to the heads and feet of the "people", so that they may be picked up by a student holding a dowel stick with stickyback female velcro attached, as illustrated. Students may use interface switches and battery toys to engage in all stages of play learning including: cause-effect learning, directed play, combinational play, imaginary play, and complex combinational play.

Resources for Adaptations

Charlebois-Marois, C. (1985). *Everybody's technology: A sharing of ideas in augmentative communication.* Order from Charlecoms Enr., P.O. Box 419, Jean-Talon Station, Montreal, Quebec, Canada H1S 2Z3; 188 pp. ($16.00).

Goossens', C., and Crain, S. (1986). *Augmentative communication: Assessment resource.* Order from Don Johnston Developmental Equipment, P.O. Box 639, Wauconda, IL 60084, 200 pp., $37.

Goossens', C., and Crain, S. (1986). *Augmentative communication: Intervention resource.* Order from Don Johnston Developmental Equipment, P.O. Box 639, Wauconda, IL 60084, 223 pp., $37.

Goossens', C., and Crain, S. (1992). *Engineering the Preschool Classroom.* Contact Southeast Augmentative Communication Conference, 2430 11th Ave. N, Birmingham, AL 35234.

Musselwhite, C.R. *Songbook: Signs and Symbols for Children.* Order from: Caroline Ramsey Musselwhite, Special Communications, 916 West Castillo Drive, Litchfield Park, AZ 85340, 96 pp., $12 + $2 p & h.

Musselwhite, C.R. (1986). *Adaptive play for special needs children: Strategies to enhance communication and learning.* Order from Pro Ed, 5341 Industrial Oaks Boulevard, Austin, TX 78735, 249 pp., $25.50.

Musselwhite, C.R. (1992). *Paving the way for literacy: Using devices and computers to enhance early bookreading and storywriting.* Contact Southeast Augmentative Communication Conference, 2430 11th Avenue North, Birmingham, AL 35234.

Wright, C. and Nomura, M. (1985). *From toys to computers: Access for the physically disabled child.* Order from Don Johnston Developmental Equipment, P.O. Box 639, Wauconda, IL 60084, 192 pp., $20.00.

APPENDIX C: DESCRIPTION OF TARGET POPULATION

This program would be used by students in both the Nursery and Preschool classrooms at the Irene Wortham Center. In addition, the centers will be used by students who visit from other preschool programs, and by able-bodied students who attend the center on a part-time basis through a reverse mainstreaming project.

> The Nursery Class consists of ten students, ranging in age from one to four years of age. One student is ambulatory and several others are beginning to crawl. Both motor impairment and cognitive impairment range from mild to profound. The centers of particular benefit to these students would be the Computer, Symbolic Toy Play, and Music Centers. The Bookreading Center would also be enjoyed, though adult or student assistance would be required.
>
> The Preschool Class is composed of eight students (one part-time). Three of those students walk independently and the remainder use crawling plus wheelchairs for mobility. Cognitive delays are in the moderate range for most students. Several of the students communicate through speech and several through signing and/or symbol use. All of the centers would be highly appropriate for students in this class.

PROPOSED BUDGET

DAILY LIVING CENTER -Kitchen Set -Table and Chairs Set -Props	$250
COMPUTER CENTER -Software -Printer	600
PRETEND CENTER -Dress-Ups Cabinet -Materials	250
WATER PLAY CENTER -Sand/Water Discovery Table -Pouring Materials/Switch	200
MUSIC CENTER -Symbol Materials -Voice Print	100
BOOKREADING CENTER -Repeated Lines Books -BIGmack	200
TOTAL	**$1600**

APPENDIX C

SAMPLE MATERIALS FOR TRAINERS

SELF EVALUATION OF SKILLS AND KNOWLEDGE
PRE-TRAINING SURVEY

Name ______________________________ Discipline ________________________

Agency/Program Site ____

Instructions: Attached is a list of knowledge and/or skill areas regarding the use of assistive technology in early childhood programs. Please consider each statement carefully and then rate your current knowledge/skills as follows:

1. I feel that I have expertise in this area.
2. I feel competent in this area.
3. I need more training to feel competent.
4. I am aware of the importance of this, but lack implementation experience.
5. I have no knowledge or skills in this area.

Knowledge/Skill Area	**Rating**				
Area 1: Early Assistive Technology Components					
1. Understanding of adaptive play strategies appropriate for young children	1	2	3	4	5
2. Understanding of beginning augmentative communication devices appropriate for young children (including light tech and high tech devices)	1	2	3	4	5
3. Understanding of computer hardware and software (including special adaptations) appropriate for young children	1	2	3	4	5
Area 2: Developmentally Appropriate Practices					
1. General understanding of developmentally appropriate practices	1	2	3	4	5
2. Ability to design a developmentally appropriate preschool activity.	1	2	3	4	5
3. Ability to design developmentally appropriate activities for young children involving use of assistive technology	1	2	3	4	5

Knowledge/Skill Area	**Rating**				
Area 3: Curriculum Components					
1. Ability to integrate assistive technology into Circle Time activities	1	2	3	4	5
2. Ability to integrate assistive technology into Center-Based activities	1	2	3	4	5
3. Ability to integrate assistive technology into Outdoor activities	1	2	3	4	5
4. Ability to integrate assistive technology into Mealtime routines	1	2	3	4	5
5. Ability to integrate assistive technology into Music activities	1	2	3	4	5
6. Ability to integrate assistive technology into Transition activities	1	2	3	4	5
Area 4: Early Assistive Technology Needs Assessment					
1. Knowledge of components of technology needs	1	2	3	4	5
2. Ability to select components appropriate for each individual child	1	2	3	4	5
3. Ability to carry-out appropriate technology needs assessment, including parents and family priorities in the assessment	1	2	3	4	5
Area 5: Individual Assistive Technology Plan					
1. Ability to design an individual assistive technology plan	1	2	3	4	5
2. Ability to implement individual assistive technology plans across the early childhood curriculum	1	2	3	4	5

Knowledge/Skill Area	Rating				
Area 6: Teaming Process					
1. Understanding of varying discipline philosophies to preschool education	1	2	3	4	5
2. Ability to identify resources and barriers to effective team functioning	1	2	3	4	5
3. Knowledge of strategies for achieving working partnerships with families and members of other disciplines	1	2	3	4	5
4. Ability to collaborate in the development of a comprehensive integration IEP	1	2	3	4	5
5. Ability to collaborate in the implementation of a comprehensive integration IEP	1	2	3	4	5
6. Ability to participate in team-based problem-solving around the needs of individual children and their families	1	2	3	4	5
Area 7: Independent Replication					
1. Ability to independently conduct an assistive technology assessment	1	2	3	4	5
2. Ability to independently design an assistive technology plan	1	2	3	4	5
3. Ability to independently implement an individual assistive technology plan across the early childhood curriculum	1	2	3	4	5

Activity Brainstorming Page

Write down the activities that occur within the daily routine.

Routine Brainstorming Page

Write down the individual's daily routine in the following space.

Brainstorming Vocabulary for Displays

Student:

Activity:

Misc. (WH-words, Exclamations, Negatives, Pronouns	Verbs	Descriptors (adjectives, adverbs)	Prepositions	Nouns

ASU/SHD EARLY CHILDHOOD ASSISTIVE TECHNOLOGY INTEGRATION GRANT

CONTACT LOG

SCHOOL/CLASS ______________________ DATE ______________________
STUDENT(S) __________________________ SHD STAFF ___________________

OBSERVATIONS:

TECHNOLOGY IMPLEMENTATION STRATEGIES AND EQUIPMENT:

TEAM ISSUES:

SUGGESTIONS:

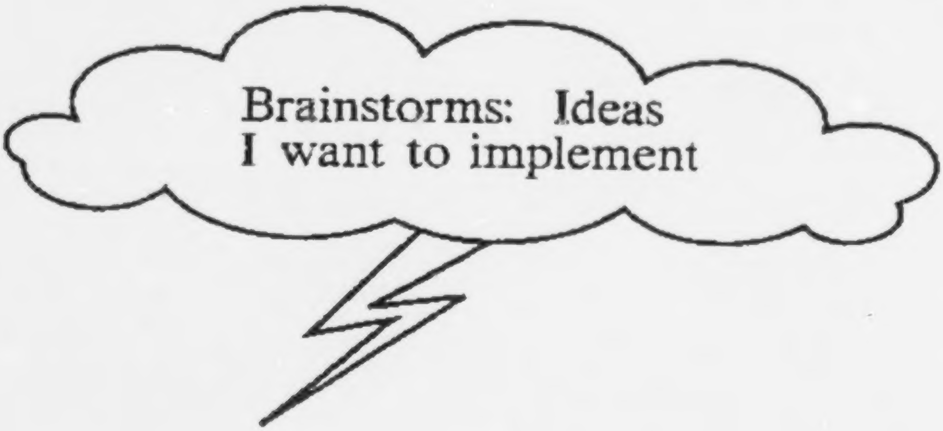
ACTION PLANS

Who	What	By When

Student:
Date:
Team Members:
Site:

COMPREHENSIVE TECHNOLOGY SUPPORT PLAN

Daily Schedule	Individual Objective	Selection of Materials/ Technology	Environmental/ Intervention Strategies	Peer Involvement
Opening Group				
Structured Freeplay				
Small Groups				
Transition				
Toileting				
Outdoor Play				
Snack				
Storytime				



Brainstorms: Ideas I want to implement

IDEA ____

____

____

____

IDEA ____

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____

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IDEA ____

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IDEA ____

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TRAINING EVALUATION

Workshop Topic: ______________________________ Date: ______________________
Discipline: ____

1. I came to this workshop wanting …

2. The part I liked best was …

3. I feel confident that …

4. This workshop would have been more inclusive if …

5. I still don't understand …

6. Next time please …

7. And one more thing …

APPENDIX D

RESOURCES

AbleNet, Inc.
1081 10th Ave, S.E.
Minneapolis, MN 55414-1312
(800) 322-0956
(switches, mounts, devices)
www.ablenetinc.com

Adamlab
Regional Educational Service Laboratory
P.O. Box 807
Wayne, MI 48184-2497
(313) 334-1610
(Wolf, Hawk, BlackHawk, SuperHawk)
www.wcresa.klz.mi.us/adamlab/index.htm

Adaptivation, Inc.
224 S.E. 16th St. Suite 2
Ames, IA 50010
(800) 723-2783
(ActionVoice, light switches)
www.adaptivation.com

Alternatively Speaking
One Surf Way, Suite #237
Monterey, CA 93940
(408) 465-5428
e-mail: sarablack@aol.com
(quarterly newsletter)

Assistive Technology, Inc.
850 Boylston St
Chestnut, MA 02167
(800) 793-9227
(Link, Companion, Freestyle)

Augmentatively Speaking
708 Drywood Avenue
Fern Park, FL 32720
(AAC newsletter)

BeachWare
9419 Mr. Israel Road
Escondido, CA 92029
(619) 735-8945
(software on CD-ROM)
www.beachware.com

Berta Max (Educational Software Center)
P.O. Box 42859
Seattle, WA 98103
(IBM & Apple software)

Broderbund Software, Inc.
500 Redwood Blvd.
P.O. Box 6121
Novato, CA 94948-6121
(800) 521-6263
(Mac & IBM/PC software)
www.broderbund.com

Linda J. Burkhart
6201 Candle Court
Eldersburg, MD 21784
(410) 795-4561
(books & IntelliPics software)
www.lburkhart.com

Closing the Gap
P.O. Box 68
Henderson, MN 56044
(517) 248-3810
(product reviews, publications)
www.closingthegap.com

Creative Communicating
P.O. Box 3358
Park City, Utah 84060
(801) 645-7737
(Software for IBM, Mac, Apple, PowerPad, IntelliKeys, switch)
www.creative-comm.com

Davidson and Associates, Inc.
P.O. Box 2961
Torrance, CA 90509
(800) 545-7677
(Software-Mac & IBM/PC)

Don Johnston, Inc.
P.O. Box 639
1000 N. Rand Road
Waconda, IL 60084-0639
(800) 999-4660
(AT products & software)
www.donjohnston.com

Dunamis
3423 Fowler Blvd.
Lawrenceville, GA 80244
(800) 828-2443
(PowerPad & software)

Edmark Corp.
P.O. Box 3903
Bellevue, WA 98009-3903
(800) 426-0856
(Mac & IBM/PC software)
www.edmark.com

Exceptional Parent Magazine
Psy-Ed Corporation
209 Harvard St., Suite 303
Brookline, MA 02146-5005
(800) 247-8080
(annual AT issue)
www.eparent.com

Gallaudet Bookstore
800 Fionda Ave.
Washington, DC 20002-3695
(signed storybooks)
ww2.gallaudet.edu

Gus Communications
1006 Lonetree Court
Bellingham, WA 98226
(360) 715-8580
(IBM/PC software)

IntelliTools
55 Leveroni Court, Suite 9
Novato, CA 94949
(800) 899-6687
(IntelliKeys & software)
www.intellitools.com

ISAAC Secretariat
P.O. Box 1762, Station R
Ontario, Canada M4G 4A3
(membership and AAC Journal)

Judy Lynn Software
278 Dunhams Corner Road
P.O. Box 373
East Brunswick, NJ 08816
(732) 390-8845
(switch software for PCs)

Mayer-Johnson Co.
P.O. Box 1579
Solana Beach, CA 92075-1579
(619) 550-0084
(Symbols, resource and activity books)
www.mayer-johnson.com

Prentke-Romich Co.
1022 Heyl Rd.
Wooster, OH 44691
(800) 262-1984
(Alpha/Delta Talker, Liberator)
www.prentrom.com

Queue, Inc.
338 Commerce Dr.
Fairfield, CT 06430
(800) 232-2224
(Mac software)
www.queueinc.com

RJ Cooper & Associates
24843 Del Prado Suite 283
Dana Point, CA 92629
(714) 240-1912
(single switch software, switch adapted mouse)
www.rjcooper.com

Saltillo Corp
2143 TR112
Millerburg, OH 44654
(330) 674-6722
(ChatBox)

Semerc (order: Promedia, Inc.)
790 Bloomfield Ave
Clifton, NJ 07012
(800) 462-0930
(Mac & PC, hardware & software)

Simtech Publications
134 East Streat
Litchfield, CT 06759
(860) 567-1173
(Adapted Mac & Windows software)
www.hsj.com

Southeast Augmentative Communication Publications
UCP of Greater Birmingham
2430 11th Avenue North
Birmingham,, Alabama 35234
(205) 251-0165
(Displays & Theory Books)
www2.edc.org/NCIP

Special Communications
Caroline Ramsey Musselwhite, Ed.D
916 W. Castillo Dr.
Litchfield Park, AZ 85340
(602) 935-4656
(songbooks, minigrant book, RAPS)

TASH
Unit 1 - 91 Station St.
Ajax, Ontario, Canada L1S 3H2
(800) 463-5685
(switches, ECU's, computer accessories)
www.tashint.com

Thirdware
4747 N.W. 72nd Ave.
Miami, FL 33166
(305) 592-7522
(Fingerprint card - Apple)

Toys for Special Children, Enabling Divices
385 Warburton Ave.
Hastings on Hudson, NY 10706
(800) 832-8697
(switches, battery operated toys)
www.enablingdevices.com

UCLA Intervention Program For Handicapped Children
1000 Vereran Ave., Rm. 23-10
Los Angeles, CA 90024
(310) 825- 4821
(Apple II Series Software)

Words+
40015 Sierra Highway
Building B-145
Palmdale, CA 93550
(800) 869-8521
(Massage Mate, Pegasus Lite)
www.word-plus.com

Zygo Industries
P.O. Box 1008
Portland, OR 97207-1008
(800) 234-6006)
(Macaw 3+, Lightwriter, switches)
www.zygo-usa.com